THE

Model Engineer

AND

Amateur Electrician.

A JOURNAL OF MECHANICS AND ELECTRICITY FOR AMATEURS AND STUDENTS.

EDITED BY PERCIVAL MARSHALL, A.I.MECH.E.

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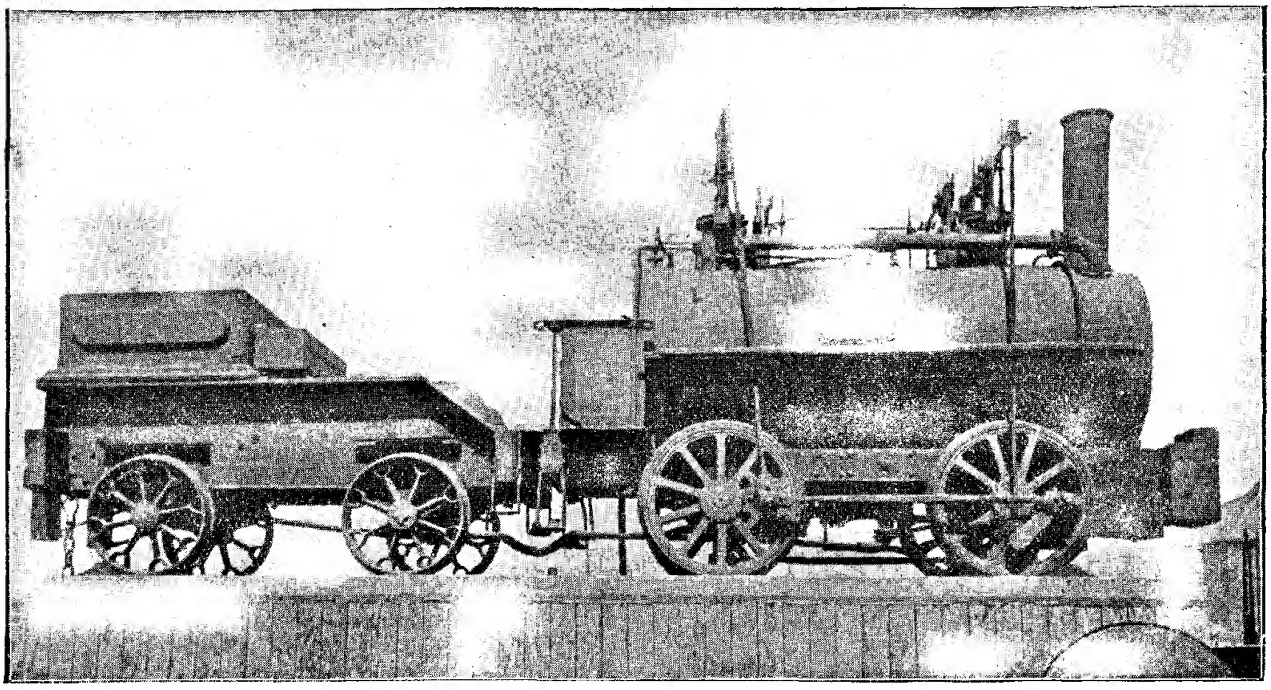
Stephenson's No. 1 Engine "Billy."

THE accompanying photograph shows one of Stephenson's engines, which was originally built for work at Killingworth Colliery, Northumberland. It had vertical cylinders of 8 ins. diam., and 24 ins. stroke, whilst the boiler was of simple construction—34 ins. diam. and 8 ft. long—and having a single flue tube. The engine is now on the platform of the Newcastle-upon-Tyne Central Station, North Eastern Railway, where every care is taken to preserve this relic of the past. The reader need only look at any of our express engines of to-day to see the contrast and note the progress we have made with the revolutioniser of the whole world. What would the inventor of the above think of our "Edinburgh to London" racers of to-day?

As a matter of fact, this engine has undergone a good deal of alteration since its earliest days, when it doubtless boasted the elongated and crudely-built chimney inseparable from locomotives of that time. The wheels are evidently modernised, and as Stephenson's earliest engines were fitted either with gear wheels or an endless chain for the two pairs of wheels, the outside coupling rod seen in the photograph is probably a later addition.



ONE OF GEORGE STEPHENSON'S EARLIEST LOCOMOTIVES.

On a tablet placed on the above engine are the words: "This locomotive engine was one of the first built by George Stephenson, for the Killingworth Colliery. It was presented to the Mayor and Corporation of Newcastle-upon-Tyne, by Sir Charles Mark Palmer, Bart., M.P., on the occasion of the centenary of the birth of George Stephenson, Ninth day of June, 1881."

The Society of Model Engineers.

London.

THE model steamer trials at the Northampton Institute took place on Saturday, April 20th, as arranged, a good number of members and friends being present. Unfortunately, several members who had promised to bring boats were unable to attend, so that the models actually on view were limited to three in number. Of these the best was a finely-built model launch, made by Mr. Chas. Baly. This was driven by a double-acting slide-valve engine and charcoal-fired boiler, and travelled the length of the bath (100 ft.) in just over thirty seconds. Mr. Blaney ran a smart little craft, which had a single-acting oscillating cylinder, and gave some very good speed results. The other vessel running was a model torpedo gunboat, supplied by Messrs. Bassett-Lowke & Co., and driven by a double-acting oscillating cylinder. This boat, built all in metal, had a handsome appearance in the water, and completed four lengths of the bath at one run. The chairman, Mr. Percival Marshall, proposed a vote of thanks to the authorities of the Northampton Institute for their kindness in allowing the Society the use of the swimming-bath on this occasion, and the resolution was carried with acclamation. Dr. R. Mullineux Walmsley, the Principal of the Northampton Institute, briefly replied, stating that they were very pleased to see the members of the Society there.

THE LIBRARY.

One of the latest additions to the Library of the London Society, is Pettigrew's "Manual of Locomotive Engineering." This volume has been purchased by the Society out of the Capital Fund. Members will find this a most useful locomotive book, dealing, as it does, very fully with a great variety of details. The number of this book will be 44, other recent additions being—

41. Locomotives and Railways, Vol. I.
42. First Principles of the Locomotive. By Michael Reynolds.
43. The Incandescent Lamp. By Gilbert S. Ram.
45. The A.B.C. of Dynamo Design. By Alfred H. Avery.
46. Practical Lessons in Metal Turning. By Percival Marshall.
47. THE MODEL ENGINEER, Vol. III.

New Model Railway Track.

The Track Committee have decided upon the construction of a new track, and Mr. H. S. Boorman has the plans and specifications in hand. It will be a great improvement on the present track in every way, and will be about 4 ft. high, which will enable members and visitors to have a better view of the models. It is hoped that it will be in operation on the first meeting after the summer months. To defray the cost of this new track, a subscription list has been opened, which Mr. Löwy has headed with a guinea. Further amounts are promised, and Messrs. Crebbin and Boorman will be pleased to hear from any other members who feel disposed to contribute towards this work.

Provincial Branches.

Glasgow.—The usual fortnightly meeting of the Glasgow branch was held in the Grand National Halls, on Friday, April 12th, Mr. Andrew Lang presiding. After the minutes of the previous meeting had been approved, ways and means were discussed as how best to increase the membership of the Society. Mr. Samuel Rae exhibited patterns for a marine engine.—ANDREW LANG, Hon. Secretary, 11, Dale Street, Bridgeton, Glasgow.

Sheffield.—There was no meeting of this branch in April, owing to the usual meeting night (the second Monday in each month) falling on Easter Monday, and difficulty was experienced in getting the room for any other night. The next meeting is announced for Monday, May 13th, at the usual time and place.—C. E. SQUIRE, Hon. Secretary, 401, Staniforth Road, Attercliffe, Sheffield.

Manchester.—The usual monthly meeting was held at the Marsden Café on April 1st, nineteen members being present, Mr. Atherton in the chair. The minutes of the previous meeting were read by the chairman and passed. After a long discussion it was decided to start a library, and several members promised to give copies of well-known technical books. Mr. Bodden exhibited some finished aluminium cylinders and frames for a model American locomotive, Mr. Buckley a finished crankshaft for a stationary engine, and Mr. Thompstone an inverted vertical engine. The meeting closed at 9.30 with a vote of thanks to the chairman.

Those who supply castings, fittings and tools, etc., for model engineering work are invited to send a copy of their catalogue to the following address for the use of members of this branch—W. C. HIGGINS, Hon. Secretary, Monton Lodge, Monton, Manchester.

Birmingham.—The third ordinary meeting of the Birmingham branch was held at the White Horse Hotel, Congreve Street, on April 18th, at 7.30 p.m. Twenty members and visitors were present. The minutes of the previous meeting having been read and accepted, the general business was transacted, and three new members elected.

The Chairman (Mr. H. Coxon) then called on Mr. J. H. Robottom to read his paper on "Dynamo Electric Machines: History—Construction," which was most interesting and fully appreciated by members, as also the few model parts of dynamos exhibited.

Mr. Fabb proposed a vote of thanks to Mr. Robottom. Mr. Knipe seconded. The meeting closed at 9.45 p.m.

The last meeting of the half-year will be held on May 16th, 7.30 p.m., at the White Horse Hotel. A general discussion on members' models will take place. Announcements for June, July, and August will be notified later.—THOMAS H. COOKE, Hon. Secretary, 117, Bevington Road, Aston, Birmingham.

Leeds.—The notice *re* the formation of a Leeds branch of the Society of Model Engineers has been successful in bringing about the desired result. We have had three meetings, and already have twenty members and several applications for membership, and it is very probable we shall add to our number considerably at our next meeting. This will be held on Tuesday evening, May 14th, in St. Andrew's Church Schools, off Burly Street, Leeds, and those who are interested in model and electrical engineering in the Leeds district, who have not already joined us, will benefit largely by doing so, as we have a good programme before us and plenty of good material to work from.—W. H. BROUGHTON, Secretary, 262, Carlton Terrace, York Road, Leeds.

Bradford.—The fortnightly meeting of the Bradford branch was held at the Coffee Tavern, Tyrrell Street, Bradford, on April 15th, 1901. The chair was occupied by Mr. A. P. Drake. After the minutes of the previous meeting were passed, Mr. T. H. Wilson exhibited a vertical tubular boiler, 12 ins. by 8 ins., heated by charcoal. Mr. Wilson gave a few interesting remarks on how he made it. The meeting closed at 10 p.m.—JAMES H. LAMB, Hon. Secretary, Holly Bank, 109, Rushton Road, Thornbury, Bradford, Yorks.

Dublin.—The third ordinary meeting of the Dublin branch was held on Tuesday, the 16th ult., at the Society's rooms, 3, Burgh Quay. The business before the meeting being transacted, the President read Mr. Crebbin's paper on "Model Boilers," which led to an nteresting discussion on boilers generally. A vote of hanks being passed to Mr. Crebbin, the meeting adjourned at 10.30 o'clock.—T. E. WINCKWORTH, 149, South Circular Road, Dublin.

To Readers in Cheltenham.

A BRANCH of the Society of Model Engineers is proposed to be formed in Cheltenham. Mr. Charles M. Gwilliam, who has long been a member of the London Society, is taking upon himself the onus of the preliminary labour, and a good response from model engineers in the district should enable him to report the formation of a strong branch. The address of the Acting Secretary is 4, Osborne Terrace, Cheltenham.

For the Book-shelf.

THE PHOTOGRAPHIC DEALER'S ANNUAL FOR 1901. London: Marshall & Brookes, Harp Alley, Farringdon Street. Price 1s. (To the trade only.)

This is the second issue of this useful annual, and we have no doubt it will prove highly acceptable to the photographic trade, for whom it is intended. Its principal contents include a directory of trade addresses; How to Start a Photographic Department; an article on side lines for dealers, describing microscopes and accessories, and apparatus for colour photography; How to Open up Business with the Colonies; shipping information; instructions for patenting an invention and registering a design and trade mark; and a large amount of miscellaneous information concerning photographic formula, legal information, trade marks, recipes, scientific societies, &c. For those dealing in photographic goods, or about to open a photographic department, this annual is a valuable book of reference.

MESSRS. RICHARD MELHUISH, SONS AND CO. inform us that they have secured an excellent space at the forthcoming Glasgow Exhibition. The principal interest of their exhibit will be a show of engineers' tools and light machinery of the latest labour-saving design, with some special apparatus for particular classes of work, and a selection of tools and appliances for various other mechanical arts. The exhibit, which our North Country readers in particular should make a point of inspecting, will be found at No. 145 Machinery Hall.

THE RAILWAY CLUB.—The April meeting of the London Centre of the Railway Club was held at the Memorial Hall, Farringdon Street, E.C., on Thursday, the 11th inst., the chair being taken, in the absence of Mr. Bruce, by Mr. J. F. Gairns at 7.30 p.m. Mr. G. F. Tyas had been announced to give a lecture, but at almost the last moment was prevented from fulfilling his promise. Mr. A. J. Chisholm, however, very efficiently took his place at very short notice, and gave an account of some of his experiences during his very extensive wanderings over the railways of the United Kingdom. Mr. Chisholm dealt more particularly with unusual incidents which had come under his notice, and with the curious features of some of the railways he had travelled on, but also spoke at considerable length on the Irish railways, which have been his special study. Altogether the lecture proved very interesting and instructive, and the hearty vote of thanks accorded to the lecturer was well merited.

Model-making for Beginners.

[*This series of articles is especially intended for those amateurs whose stock of tools is a minimum, and for those whose practical acquaintance with model-making is equally limited. In order to make the articles as useful as possible, it is the special desire of the writers that readers shall discuss their difficulties with them, directing their queries to "Beginner," c/o The Editor, THE MODEL ENGINEER, 37 & 38, Temple House, Tallis Street, London, E.C., a stamped addressed envelope being invariably enclosed for reply. Where the reader is unable to get a model to work, or to locate the fault, the model itself should be sent, carriage paid both ways, when advice on it will be freely given.*

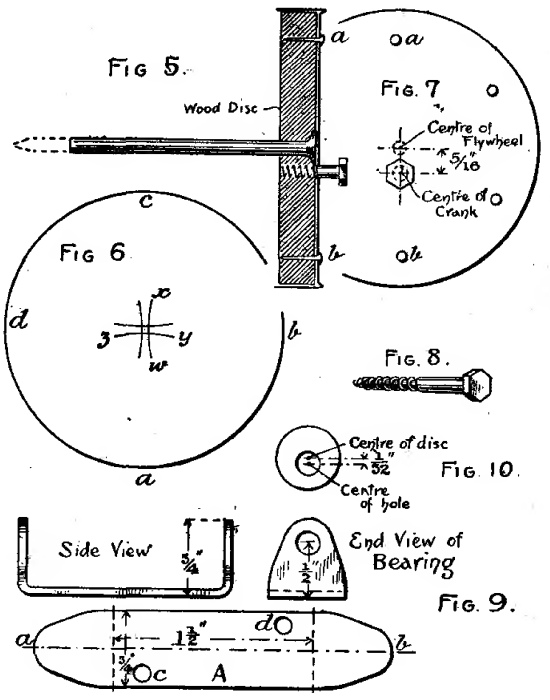
Practical suggestions from readers will be gratefully received, and the Editor will be glad to hear from those who wish to make any special model. Such suggestions will, where possible, form the basis of future articles.]

III.—How to Make a Simple Electric Beam Engine.

By "VULLAS."

(Continued from page 203.)

THE electro-magnet being disposed of, we may proceed to construct the flywheel and crank. The former consists of a good sized coffee-tin lid, about 4 ins. diameter and ½ in. wide, a plain lid being preferable for the purpose. First find the actual diameter of the lid *inside*, and then with a pair of compasses describe a circle this size exactly on a piece of nicely planed wood a little less than ½ in.



thick. Cut this out carefully with a fretsaw to get an accurately circular disc. Find a large French nail, one about 3 ins. long and 3-16ths in. diameter will be right. At the centre of the wood disc (marked by the compass leg) drill a small hole as carefully as possible to get it exactly at right angles. Try if it is correct by means of a straight wire fitting the hole, and a set square or ordinary steel square. If correct, drill the hole larger, being careful to follow the first hole, and make it big enough to allow the French nail to be driven in tight.

Before putting in the nail about ½ in. of its point end should be cut off square. The hole in the wood disc on one side must then be countersunk a little to allow the head of the nail to go in almost flush. I say "almost," because it will be better if anything for the head to stand out a trifle. Drive the nail in—it should go in quite tight, and then put the tin lid over the disc, which should, of course, fit inside it fairly tightly. Reference to Fig. 5 will help to make matters clear.

In Fig. 5 may also be seen at *a*, *b*, two little tacks. There should be half-a-dozen of these disposed equally round the wheel, and they may be driven straight through the tin into the disc of wood, if the latter be supported on something solid just underneath. Round-headed brass tacks, of course, look best, but are not indispensable.

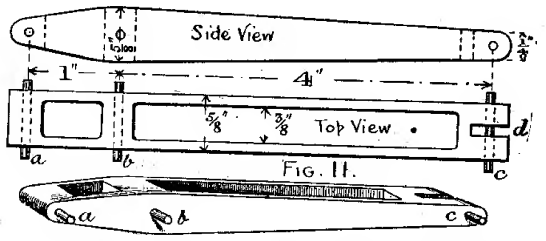


FIG. 11.

If everything has been carefully done, the wheel should run pretty truly with the nail as axle, but if carelessly or unluckily mounted, it may "wobble" or run eccentrically. In the first case the remedy is to knock the nail square with the disc, and fix it there with a piece of brass plate, or even wood, screwed to the disc and bearing hard on the nail on the side towards which it tends to incline. In the other case, if the eccentricity is little, it must be put up with. If much, a new wood disc, more carefully cut out, is the only remedy.

The next thing is to find the centre of the flywheel. This can be done by means of a pair of calipers. They should be opened as near as can be guessed to the half-diameter, one leg placed at *a* (Fig. 6), and the arc *z*, *y*, struck on the tin. Then one leg is placed at *b*, and the arc *w*, *x*, is marked. This is done again at *c* and *b*, when the centre of the wheel is quite apparent. At a distance of 5-16ths in. from the centre (see Fig. 7) make a mark and drill a hole suitable to take a No. 6 wood screw. This hole can be punched and rimered out with a tang end of a file. Prepare a round-headed No. 6 brass or iron screw by filing the round head down to a disc, and filing this again to a hexagon (Fig. 8); *this* is not an essential, but it adds to appearance, costs but little time, and is good practice. This screw has to be driven nice and square into the hole in flywheel; it should project about ¼ in., and forms the crank pin of the engine.

The bearings may be made in one stiff piece of brass 3 ins. long, ⅞ in. wide, and 1 16th in. to ⅛ in. thick. This should be filed to the shape shown at A Fig. 9, and the two ends bent up at the dotted lines, so that each end is ⅞ in. high, and the middle piece 1½ ins. long. If a centre line (*a*, *b*) has been marked on what will be the outside of the bearing, it will be an advantage in setting out the holes for the shaft. These holes must both be marked off at the same height, and drilled to suit the shaft. The beginner will doubtless drill the largest hole he can to start with, and rimer it out with the tang end of the file—the motor built for the purposes of this article is as innocent of lathe work as any "machinery," and the drilling was no exception—yet it runs, and runs well.

The holes in bearings must be no bigger than will allow the shaft to run in them quite easily; they must, of course, be in line. Drill two holes in the base part of the bearing (*c*, *d*, Fig. 9), close to the edge, and big enough to take any ordinary screw, say, ¾ in. long.

Before quitting this part of the machine, the contact piece on shaft may be described. It may be a circular piece of brass, filed to shape, and about ⅜ in. diam. It has a hole drilled so that it will just *drive* on the shaft (by which is meant the French nail); but the centre of this hole is about 1-32nd in. away from the real centre of the disc. It can all be seen in Fig. 10, by which it will be observed that the contact piece is really a little eccentric. A farthing is rather larger, but might form a handy ready-made disc.

The oscillating beam for the engine looks like a massive casting, but this it is not. It is simply a piece of wood cut to the shape shown in Fig. 11. The spaces seen in the top view are cut out with fretsaw, simply to lighten and add to the appearance of the beam, and holes are drilled at *a*, *b*, *c*, very accurately, to take three 1½ in. French nails tightly. A space is cut out at *d* for the connecting-rod top end.

The connecting-rod is a piece of stoutish brass—say, 1-16th in. thick—shaped as in Fig. 12. (Readers will forgive me for not entering into much detailed description, as many of the parts, such as this connecting-rod, can be made quite as readily from a sketch, as given, as from many lines of description.) The hole at top end must be big enough to run freely—but not too slack—on the French nail at *c* in Fig. 11, and the other hole must similarly fit the neck of the screw crank-pin (Fig. 8). Filing is the method adapted to make the rod.

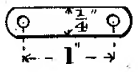


FIG. 14.

The armature for the electro-magnet is the next item. The more substantial it is the better, and in my case it is about 2 ins. long, ¾ in. wide, and full ¼ in. thick. Any odd piece of soft iron is suitable, as, for example, a portion of a broken wall bracket, which does service in the present engine. The armature is carried by two thin pieces of brass (Fig. 13) which are fixed by rivets.

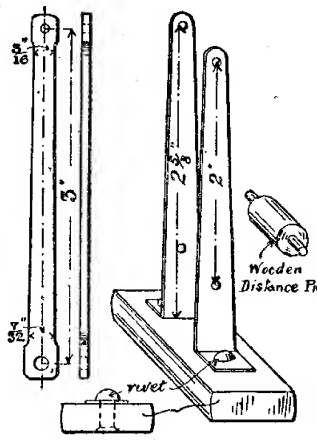


FIG. 12.

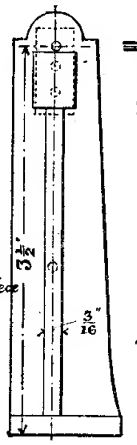


FIG. 13.

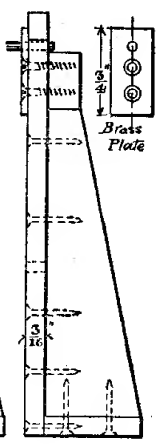


FIG. 15.

These latter consist of portions of round-headed iron screws, rivetted with countersunk holes on the underside of the armature, as shown in the little section of same. The rivetting must be well done, as there is some considerable strain. The sizes of the brass suspending-pieces are given, and that all the holes shown are just big enough to run easily on the 1½-in. French nails already mentioned.

A pair of links of thin brass like Fig. 14 are also required. Holes to run easily on the small French nails.

The upright supports for the beam require to be nicely made. Thin fretwood or cigar box wood is suitable, and

the construction is shown in several views in Fig 15, in which is shown a brass plate with three holes. The top one carries the French-nail shaft *b* in Fig. 11, whilst the other two are countersunk for screws which go through the upright and into a neat wood block. The base is fitted exactly at right angles to the upright pieces with glue and stout pins, while a web is fitted and fixed by glue and pins to the structure. A hole is drilled to take a 1½-in. French nail tightly at *d*. Two standards as described are needed, and must be identical.

All is now ready for building up. A baseboard of any smooth flat wood, 8 ins. long, 4½ ins. wide, and not under ⅜ in. thick is to be made, and also an "upper

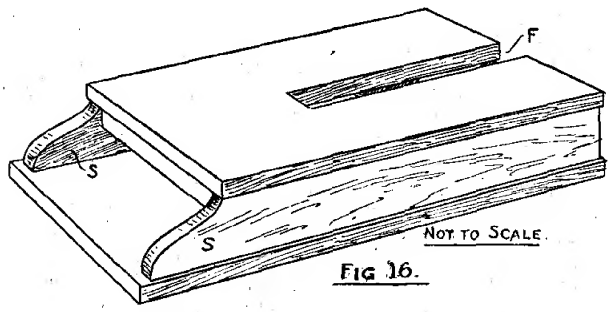


FIG 16.

floor," 6¼ ins. by 4½ ins. by ⅜ in. These are made into the form sketched in Fig. 16 by two sides (S, S) of stout wood, but before fixing together a slot as shown must be cut out of the top floor for the flywheel, and strengthening pieces as given in the drawing, Fig. 1, must be affixed underneath. These need not be nicely finished off, but must be stout enough to take screws without splitting. They are secured to top, bottom, and sides of box by means of screws.

Take the flywheel (to the crank pin of which the connecting rod has been attached) and thread the shaft through one of the journal holes in the bearing. Now drive the eccentric contact disc on the shaft to about ½ in. from the outward end. The eccentric must have a definite position with regard to the crank, the longest side of the eccentric being at right angles to the crank itself. This position is shown in Fig. 1, and is such that when the crank is at its lowest point, and the armature at its highest, the eccentric just begins to make contact with a spring, and continues in contact until the crank has reached its highest and the armature its lowest point. Thread the shaft through the second bearing, which must come close up to the eccentric. Put the fly wheel in its place in the slot F (Fig. 16) so that it has an equal space on each side of it, and screw down the bearing with two round-headed screws.

The beam (Fig. 11) may be laid on the bedplate, and its position marked off. It will then be easy to see where the standards (Fig. 15) are to be put to support it, and also where to fix the electro-magnet. The French nails are fitted in their respective places, joining up the connecting-rod, armature, standards, and beam, and also joining the short links (Fig. 14) to standards and armature.

A contact spring of very thin springy brass or copper, as shown in No. 18, Fig. 1, is fitted in the position shown in the general view. It has one hole near the end, by which it is fastened to the wood block, a copper wire being looped under the spring here. Another hole a little further along takes a screw, which passes into the base, and this screw is used to regulate the pressure. As already hinted, the position of the contact spring should be such that contact is made during half a revolution of the flywheel. The wire from contact screw goes direct to one of the terminals on the base board. Another wire, attached to one of the screws of the bearing (Fig. 9) is led to one end of the electro-magnet winding, the other end of which goes direct to the second terminal.

If it is desired, one of these wires can be broken, and a simple switch inserted, as shown in dotted lines in the plan view (Fig. 1). A more ambitious arrangement could easily be devised by making the switch of an upright lever type, like the reversing lever of a locomotive engine.

Except for painting up, which can be done to the taste of the amateur, the model is now finished, and will run at great speed if the wires from either of the batteries previously mentioned be attached to the terminals. A tiny drop of oil on each of the bearings will greatly improve the running, and does not appear to interfere with the flow of the current through the shaft and bearings. Too much pressure on the contact-spring is not advisable, nor too little; but this can be regulated by means of the screw provided for the purpose.

It is worth noting that the whole of the work must be *strong*. The pull of the electro-magnet is so powerful that it will soon knock the machine to pieces if not well fitted on a strong, rigid base. The electro-magnet must be so fixed that the armature, when at its lowest position, just clears the poles by 1-32nd in., and contact should cease just before the armature reaches that point, or the motor will make a terrible noise, which, while it is music to the enthusiastic builder, is perfectly distracting to friends and neighbours! Finally, though it is perhaps unnecessary, it may yet be worth while stating that the horse-power of this little machine is *not* to be measured in integers—nay, it may best be expressed in decimals—but it *will* run, and that is one good quality in a working model!

Motor Cycles and How to Construct Them.

By T. H. HAWLEY.

(Continued from page 202.)

VI.—FILING AND POLISHING THE FRAME, BUILDING UP THE FRONT FORKS, ETC.

ASSUMING that the work in connection with the brazing up and alignment of the bridged axle has been satisfactorily completed, the next step in the frame construction will be the brazing of the frame to the bridge piece at the tail end of the 1⅜-in. tube; but before this is done, every care must be taken to ensure absolute completion of all brazing and setting of each piece, as once this joint is made, the frame becomes very unwieldy and difficult to operate on in the brazing hearth.

Before brazing this joint, therefore, it will be well to repeat all tests, and examine all joints, and a word here may be offered on the subject of filing up and polishing the frame joints.

This might appear a matter on which no instruction or suggestion were required, but, on the other hand, I am inclined to think that one unaccustomed to the work would be in danger of seriously impairing the strength of the frame structure through injudicious zeal in the use of the file, particularly so as the brazing is not likely to be so neatly done as if performed by a skilled hand.

When the work comes from the brazing hearth it is more than likely that there will be a considerable quantity

of surplus brass on the outer surface of both tube and socket, and also considerable hard scales, and the sight of this is apt to render the workman impatient, and cause him to use coarse and unsuitable files for the quicker removal of the surplus stuff. Apart, however, from merely cleaning the joint, the filing up is more or less of a shaping operation, for the outsides of the socket castings have not been machined, and it is more than likely that the bore is somewhat eccentric to the outside, in which case the socket must be equalised by the file; then, again, the socket lip will be thick at the edge, and it requires tapering away to a knife edge almost, or, say, in the case of a motor tricycle frame, such as the one under discussion, to a thickness not exceeding 1-16th of an inch. This tapering operation is not done entirely for appearance sake, though the work is vastly improved in appearance by it, and there is room for the exhibition of some artistic feeling in bringing out the curves, sweeps, and straight lines; thus, a socket might be equalised and reduced to the necessary thickness all round the mouth by carrying the stroke of the file only some quarter of an inch back, but in such case the socket would have a hump-backed appearance, and would moreover be unequal in the thickness of its walls at any one point, if eccentricity of bore existed. The stroke of the file should therefore be carried the full length of the socket, so as to leave a straight line and an equal body of metal, gradually increasing in thickness from the knife edge to the shoulder, care also being taken to leave a nice rounding or sweep at the fillet or junction between the lines of the adjoining tubes. A 10-in. bastard file of square section, is about the right thing for this work, an old file of this size being used first to remove the scale; a few half round and rat-tail files are also required in both coarse-cut and half-smooth for working out the sweeps.

It is, however, in cleaning up the tubes around the socket mouths that the real care is required, and the tube itself should never be touched with a coarse-cut file, so that if the brass or spelter is in lumps or in considerable quantity, and it is necessary to employ a coarse-cut file in the removal, every care must be taken that the coarse file does not penetrate the brass and dig into the tube, for it must be remembered that a 20-gauge tube is *less than 1 millimeter*, or about 1-32nd in. thick only, and that the point where this tube joins the socket is the point where the greatest stress comes, so the tube must not be further weakened by "nicking" in with the file.

The theory of granulation is now well accepted and proved in practice; take a moment's thought as to what occurs in the frame of a cycle which is being propelled over bumpy roads.

The various tubes are in a constant state of violent vibration, and any sudden check to this vibration, will, if constantly repeated at one point, cause a granulation or structural alteration in the arrangement of the molecules of the metal, which will in time render the tube brittle at this point, and the line taken is around the tube at the point where it enters the socket, precisely where the danger exists of nicking in with the file in the process of cleaning up the joint.

To follow this matter a little further and go back a stage, remembering the original thickness of the tube wall. In the first place, it is impossible to braze the joint without losing more or less of the tube thickness by oxidation; then in the next place, the heat required for brazing alters to some extent the nature of the steel, for in the process of *cold* drawing the tube is rendered both hard and tough, but in brazing the toughness is removed, and the process has an annealing effect, unless cooled by quenching, which in turn is a dangerous expedient, unless the character of the steel is known, for quenching in some cases would cause hardening and brittleness.

Then, after the loss by oxidation (which can hardly be avoided), there is the further probability or danger of overheating or "burning" the tube; a fatal condition, because the steel is robbed of certain constituents, changing its nature entirely, and, in some cases, leaving it with little more strength than cardboard.

Then follow the dangers due to pickling, filing up, and polishing, so that the importance of protecting this particular point in the tube work through all the various operations, cannot be too strongly impressed, and the function of the serrated liner or ferrule is now apparent, though let it be repeated that this liner is something worse than useless unless it be well brazed and in metallic contact with the tube throughout its length, and particularly at the points of the tongues.

The statements on vibration and granulation hold good for ordinary cycles, but the importance of the matter is emphasised in the case of motor-driven vehicles, which are subjected to much more severe shocks under a considerably increased weight.

To return to the filing up of the joints, the lip of the socket must be trimmed up a clear-cut straight line for smartness of appearance. When with a coarse-cut file the bulk of the spelter has been removed, continue with a hand smooth flat safe edge until the tube is almost reached, but still having a "brassy" appearance. At this stage take an old, flat, smooth-cut file, one face of which has been ground down smooth, and with the edge of this shape up the lip of the socket. Do not again touch the tube with a file, but finish with an emery "stick"—*i.e.*, a piece of flat wood some 2 ins. wide by 15 ins. long, on which is glued a strip of Oakey's No. 1 or 0 engineers' twilled emery cloth covering the whole of one face, and being clean cut with a knife on one edge, so that it may work well up to the socket lip; this, when new, is almost as powerful as a file, and should be used with discretion.

Other emery sticks of different widths and with rounded edges for sweeps will be found useful for getting round sockets and sweeps, and the actual polishing off will be done with long strips of the same emery cloth, bearing in mind that if the best finish is desired all file marks must be obliterated, or they will show up in the enamel.

As a further means of protecting the tube at the joints, the whole of the filing and polishing on the outer surface of the socket should be completed before the brass is entirely removed from the tube, because then the tube is protected from a slip of the file. Another little point in conclusion of this subject. In some joints—such, for instance, as a front fork, where it joins the crown piece—do not clean away the whole of the brass to leave a sharp, square-cut appearance, but round it off with a small rat-tail file; this not only gives a better appearance, but adds to the strength of the joint, as the brazing surface contact is slightly increased.

In connection with filing and polishing, I had almost forgotten to give a word of warning respecting the handling of tubes in the vice. On no account should the tube work be gripped in the ordinary jaws, or it is sure to be scratched at least, but most likely flattened in places, or have indentations made through slipping out of the jaws on to the sharp, square edges beneath, and either of these defects are difficult to remedy in any case, but particularly so when there is no access to the interior of the tube.

But, in case such an accident happens, if the tube end is open, a drift must be made just the size of the tube bore and driven down with the tube cold, the drift being well lubricated; then, with the drift in position inside the tube, the indentation may be further obliterated by gently hammering the surface.

When the interior of the tube is closed and the drift cannot be used, the only remedy for sharp indentations is to run some spelter in so as to bring up the surface;

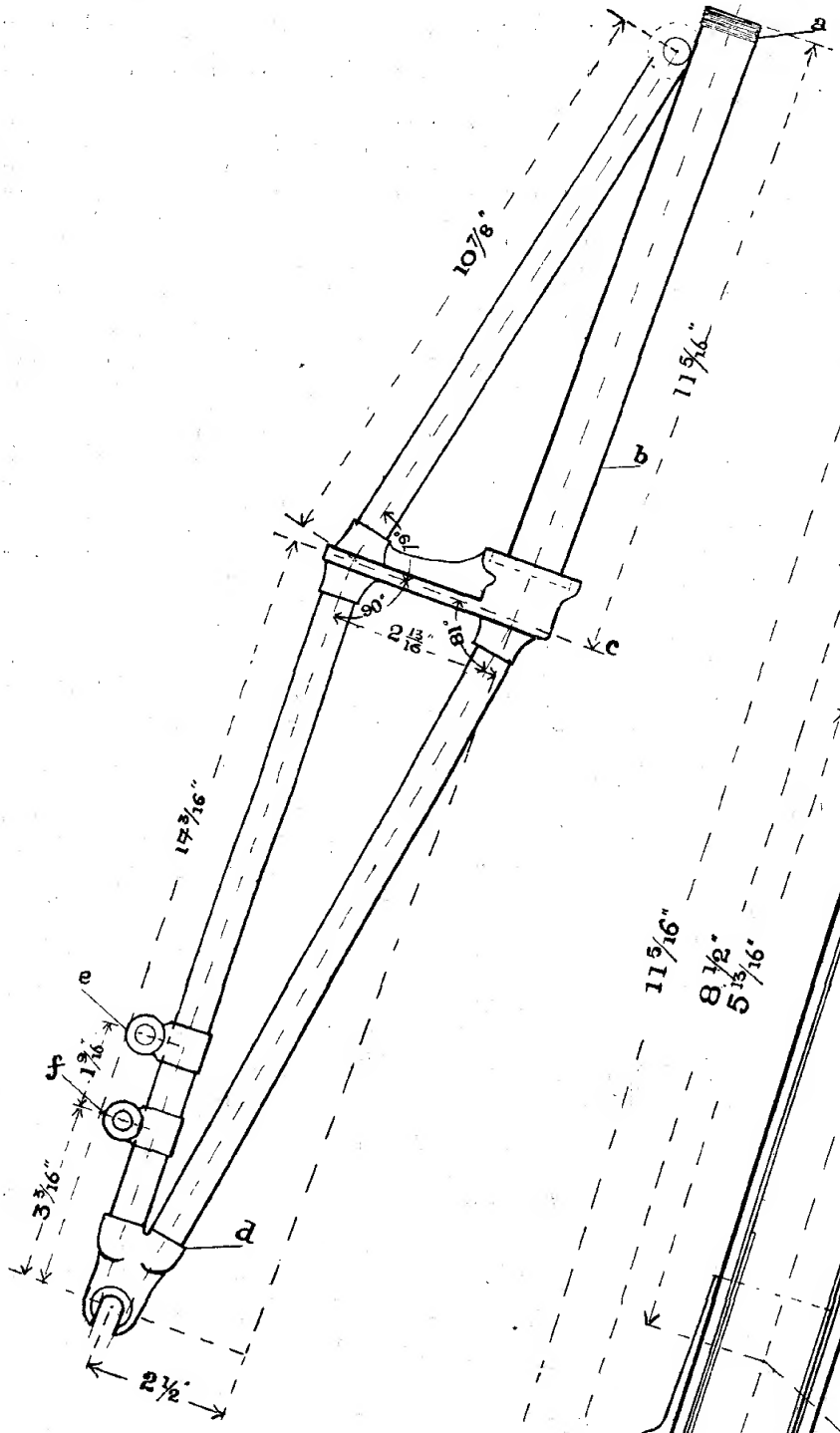
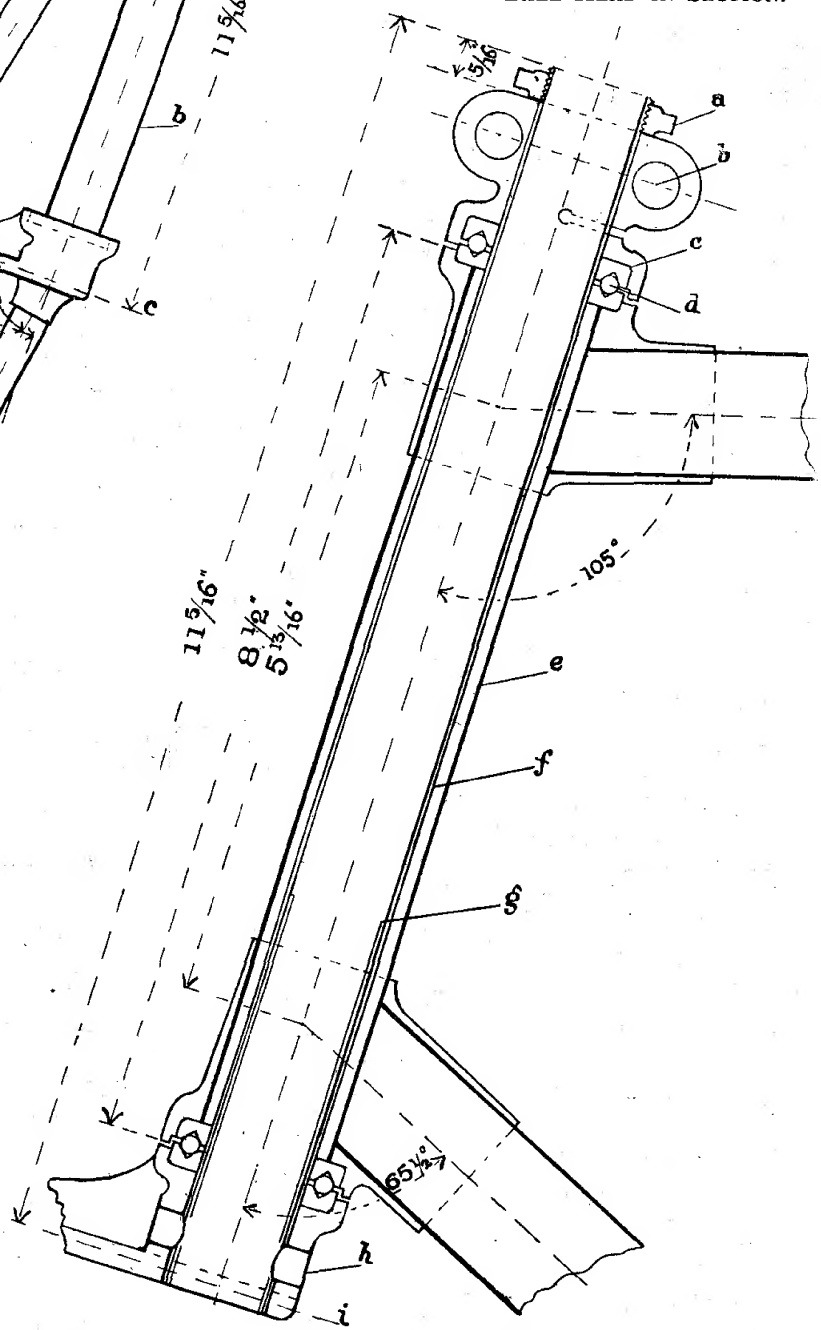


FIG. 22.
COMPLETE FRONT FORK.

FIG. 23.
BALL HEAD IN SECTION.



but with a flattened tube the shape may be restored by rolling or rocking it to and fro in lead, iron, or hard wood jaws fixed in the vice, the jaws being bored or having half round channels formed corresponding to the size of the tube to be operated on.

For holding the frame tubes during cleaning up, the vice is fitted with loose hard wood or vulcanite jaws having such half circular grooves for holding the tube, and it is a great advantage if the vice be a swivelling one.

As the frame approaches completion and becomes unwieldy, it will be necessary at each position in the vice to prop up the extremities of the frame, supporting the weight to prevent "kinking" the tube, and for certain parts of the polishing operation. A steel mandrel fixed vertically in the vice will be found a convenient support for the frame when passed through the head socket or down the seat post.

Before finally brazing the frame front to the bridged axle, carefully test the position of the 1⅜-in. bottom tube for alignment with the ball head and seat post; a pair of long straightedges laid on each side the frame from the bottom of the ball head (just above the socket) to the tail of the rear tube will leave the seat-post tube standing clear and equi-distant between the straightedges if the frame is true; but if this is not the case, then the tail tube must be set over slightly until perfectly true, and in the absence of straightedges the test may be equally accurately made with a length of ordinary white sewing-cotton passed around the head tube and down each side.

The tube may now be fitted and pinned into the socket on the bridged axle, and if this socket has been correctly bored, the axle will stand at true right-angles to the frame, and a test for this had better be made before the joint is brazed, as the condition is a most important one and must be secured at any cost if the nice steering of the machine is to be ensured.

There are several methods of making this test; it may be done by trammels or by direct measurement, or by a long straightedge laid on the side face of the big gun-metal gear wheel on the balance-geared axle; and the latter is the most reliable if available at this stage. This gear wheel is mounted on the driving-axle proper; and if when revolved its side face runs perfectly true, it follows that a straightedge laid along that face will be at a true right angle to the axle, and that, therefore, if the frame front be parallel to the straightedge, the whole structure is true.

Failing the gear wheel test, however, we may take the two extreme ends of the axle or bridge piece, or any two such points as are equi-distant from the frame tube centre, and with a trammel or kind of gauge made from a length of steel rod, try the measurement from the front of the ball head to each of the points on the axle in turn, when, if the frame is true, and supposing the axle proper with ends centred to be in position, then the pointed end of the trammel would enter into the centre dot on each side, forming a true triangle with the axle as a base and the ball-head centre its apex.

At this point I might, perhaps, crave the toleration of those readers who are sufficiently advanced in mechanical matters generally to see plainly for themselves the best course to pursue in such matters as the above, and in other minor points touched on in the present paper; but my plea must be that there are others to whom just such information and instruction is necessary to ensure success in the work being undertaken, as the overlooking an apparently simple job or test, when taken in its turn, may cause endless trouble or partial failure by discovery at a later stage.

Hence, I wish to emphasise the importance of ensuring the greatest attainable degree of accuracy at each stage, step by step, as we proceed, so that there shall be no turning back and undoing of work; the stage we have now arrived at in the frame construction being a vital case in point.

Not only, however, must the axle be at true right-angles to the frame horizontally, but vertically as well. This also may be arrived at by trammelling from the axle centres to the top of the seat post, though a more delicate test may be made with the plumb-line if a really reliable spirit-level is at hand. Place a true straightedge along the top of the bridge, and see that the straightedge is truly parallel with the bore through the bearing brackets; place the spirit-level on top of straightedge, and pack up one end of axle until level shows true. Now hang a weight by a white thread line from top of seat post centre, and in a good light a quick eye will detect the slightest deviation from parallelism between the white thread and black tubing of the seat post.

This fine test, however, need scarcely be applied until after the joint is brazed, as, with all possible care, it is more than likely that some movement of the tube within the socket, either during pinning or brazing, will upset the position somewhat, and a certain amount of "setting" is to be expected, though avoided if possible.

Having successfully accomplished the union of the bridged axle and the frame front, the next step in order is the fitting of the seat stays, from the seat clip to the lugs at each end of axle bridge. If all were geometrically correct these stays would, of course, be of equal length; but in this case it is policy to ignore that and fit the stays up separately. These tubes are shown on the drawing (Fig. 3) in Art. 2 as being 14 3 16ths in. by ⅞ in. diam. and 16 gauge; but this is not the proper tube length, as it does not allow for the increased distance due to the spread of the tubes. Therefore, take tube lengths from the actual frame in progress and cut the tubes slightly long, brazing in the lower end lugs first, and before fitting the upper end lugs fix the stays in position on the axle bridge by their bolts, and adjust the angle of spread until the two tubes sit correctly in line for the seat-post clip; they may then be trimmed off to exact length and the upper lugs brazed in.

The next piece of work in connection with the frame is one of some importance and demanding careful treatment—this is, the building up of the front fork, a dimensioned working drawing of which accompanies this, and shown in Fig. 22, dimensions and tube-gauges also being given in Fig. 3 Art. 2, reference to the latter showing the forward tubes to be 9-16ths in. diameter by 18 gauge, and the rear fork tubes ⅝ in. diameter by 18 gauge.

The present drawing (Fig. 22) should be studied in connection with the accompanying drawing of complete ball-head in section (Fig. 23), in which the inner tube or steering post *f* corresponds with the tube *b* in Fig. 22.

It is possible that in building up the frame the overall distances of ball-head lugs (8½ ins., Fig. 23) may have been exceeded, but no damage will be done if the steering post (*b*, Fig. 22) be made correspondingly longer.

The first operation will be machining the "fork crown" or headpiece *c*. I have not thought it worth while to give either a plan view or front view of this, as the side-angle of spread may vary with the type of front hub used, and, of course, the hub should be at hand when this is being built up.

All necessary information, however, is given in the present drawing of side elevation, and the forging itself, which will have to be purchased, will be sufficient guide for the points not given; by the way, this crownpiece must be a forging or stamping, malleable casting will not be reliable.

(To be continued.)

A Small Accumulator Installation: How Made and How Worked.

By F. SALTWELL.

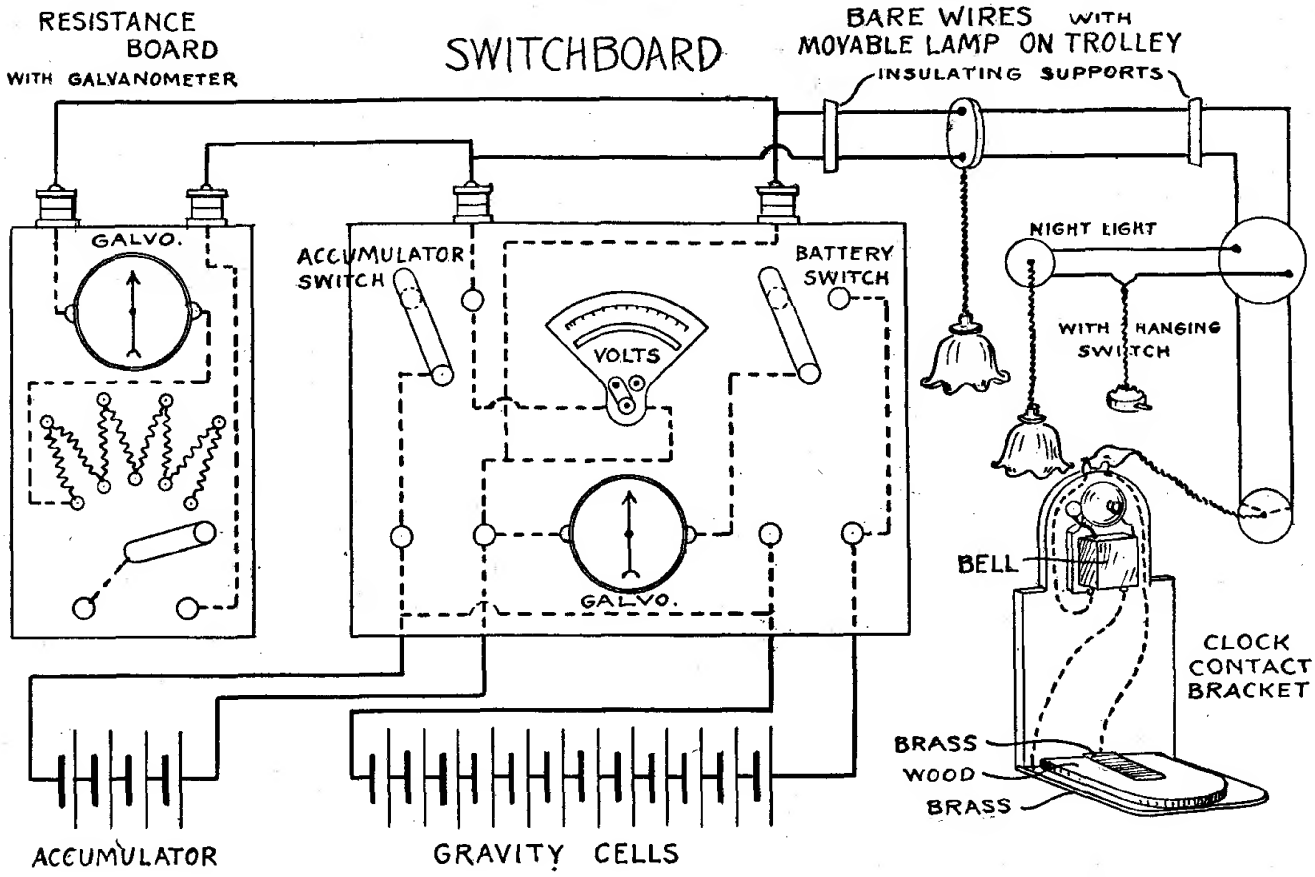
THE following particulars of my small battery installation may prove of service to many amateurs who, like myself, have not the convenience of a dynamo and gas engine or other motor. The accumulator set I am about to describe will light several 8 volt lamps and drive a small motor, work an induction coil, and ring an electric bell attached to an alarm clock. Pocket accumulators can also be charged in parallel with the large ones, and so be always ready for use.

The accumulators consist of four glass cells, 6 ins. by 4½ ins. by 2 ins., each containing five plates, two positive and three negative, 5 ins. high by 4¼ ins. wide. The grids I cast in plaster moulds, first making a pattern of a grid half the thickness, placing it on a sheet of glass with a wood rim 7 ins. square, and pouring in the plaster, which should be Keene's or Parian. (Plaster of Paris is not much good for this, as the heat perishes it.) When this is set the pattern should be removed, and several grooves cut in the half-mould round the outside of the grooves where the metal is to run. This will ensure the two halves of the mould fitting together exactly. The pattern should now be reversed very carefully, the wood rim put round the plaster block, the face and pattern being slightly greased, and the other half poured. If care has been taken in making the pattern so that all edges are slightly taper, it should come out quite clean. It is a good plan to polish the mould with some good black lead when they are ready, and be sure the plaster is perfectly dry before attempting to pour the grids.

The metal used for the grids was an alloy of lead and antimony; this is much stronger than lead, and the current scarcely acts upon the metal, consequently giving a much longer life to the plate. In addition to this the alloy pours cleaner than lead alone. The correct proportions are 1 part of antimony to 9 of lead. The alloy is easily made over a kitchen fire, the antimony being melted first, as it takes rather more heat, and the lead put in after, the whole being stirred with an iron rod. When I cast my grids I used a quantity of old sheet lead I had by me, and the antimony I obtained of Messrs. Young, of Sun Street, Finsbury, at 8d. per lb.

The positive plates were pasted with red lead and a solution of ammonium sulphate; the negative with litharge and ammonium sulphate solution, with about 1-10th its bulk of sulphuric acid. If about ¼ of its bulk of acetic acid is added, the plates "form" in about half the time, but are not so durable.

When the plates have been pasted they should be stood aside in some warm dry place to dry, and it is at this point that most amateurs seem to meet with failure. They very seldom allow the plates sufficient time to dry properly; I always let mine stand a week, and when this is done a plate never goes to pieces in the forming. When they are quite dry (and heat should not be applied to hasten this process as it causes the oxide to shrink) they may be coupled together in some temporary manner, such as lead wires soldered to the lugs and placed in the cells (a pair at a time in each cell) and the electrolyte run in. This latter should be pure sulphuric acid (known as brimstone acid) diluted with about four times its bulk of soft water and a small amount of caustic soda added. The



charging current should be switched on as soon as possible, and should be continued without intermission. The plates in my case were "formed" two at a time by four gravity cells, and each pair took about fifty hours to become fully formed.

During charging the positive plate will rapidly become dark brown, and later on a lighter colour will appear having a dry appearance; this again will gradually disappear, leaving the plate a very rich dark brown. Meanwhile the negative plate has been gradually changing to a very dark grey, and this should be complete about the same time that the positive has assumed the rich dark brown. If this is the case the plates are fully formed, and it is quite unnecessary to continue the charging current any longer, although it will do no harm. The cells should then be discharged in some normal manner, such as through a lamp or a resistance sufficient to keep the discharging current down to the correct limit for the size of plate. It is of the utmost importance that the plates be discharged before removing them in order to make up the cells, as if the plates are taken out in a charged condition they will become hot, and very often cracks will show themselves in the oxide. If it does not occur at the time, the plates will soon lose capacity. I have known negative plates become so hot in about twenty minutes, that the hand could not be borne upon them when they have been removed from the electrolyte before being discharged. When the voltage of the cells drops to 1·9, the plates may be taken out and well rinsed in cold water and allowed to dry, after which they are ready to be coupled together in whatever permanent manner has been decided upon.

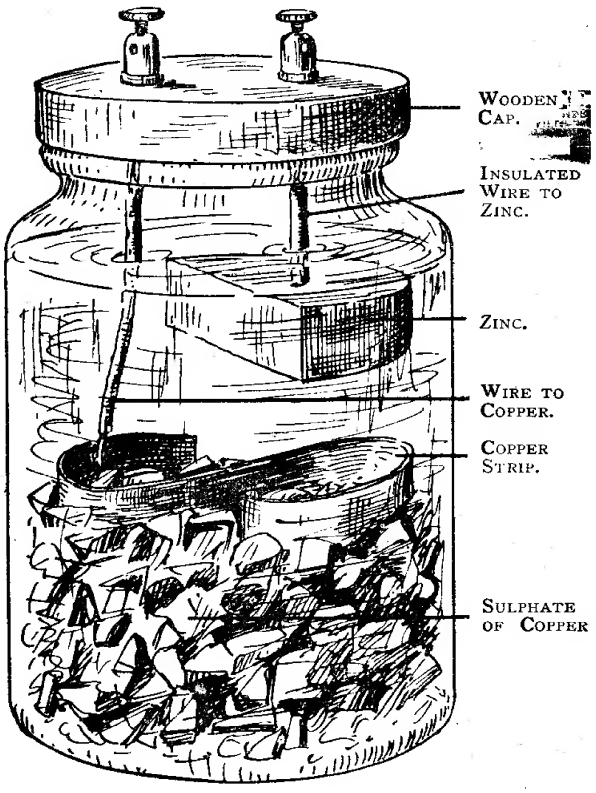
A small ebonite peg is fixed in each corner of each plate, projecting about 3-16ths in. on one side; this keeps a uniform space of about 3-16ths in. between them, and the whole five fit the width of the cells so that other support is unnecessary. The five plates are raised off the bottom on two Δ-shaped pieces of ebonite laid crosswise. Long lead wire lugs are carried well out of the cells from each plate, and the positives and negatives are clamped together respectively, so that by undoing the clamp any single plate can be removed with very little trouble. These cells have been working twelve months, and give no trouble whatever.

When the four cells were complete, they were connected in series, and twelve gravity cells made up. These cells seem to be very little known to amateurs, or would be much more widely used, being simple and cheap. In my case they consisted of a sheet of copper 7 ins. by 2½ ins., bent so as to go across the bottom of a 3-lb. glass jam jar (those with the large open neck are best). The copper strip can very well have about twice the area above-mentioned, and may be about 10 ins. by 3 ins., with advantage; it need only be very thin "foil," as the action of the cell thickens it in the course of time. The strips are bent into an S-shape, and stand vertically in the jar, as shown in the accompanying sketch, which is a view of the complete cell.

By having the copper plate vertical, it prevents any accumulation of sediment that may fall from the zinc on to the copper and prevent the action.

The zincs I cast in a plaster mould. They are semi-circular in shape, and about 1 in. thick, with a copper-wire cast in. These hang in a horizontal position to one side of the jars, so as to allow fresh sulphate of copper to be dropped past the zincs, which should be about 2 ins. above the copper, to the bottom.

To make up the battery, having inserted the copper strip in its place, about half fill the jars with a solution of sulphate of zinc or a weak solution of sulphuric acid and drop about 1 lb. of copper sulphate to the bottom, when the liquid should rise just over the zinc; if not, a little more zinc solution can be added. When made up like this I find my batteries will not require any more sulphate of copper for two or three weeks, and the solution need not be renewed for months. When I first experimented with these cells they required cleaning out about every month, and creeping used to take place to a great extent. To prevent this I poured about a ¼ in. of ordinary machine oil on the top of the solution; this has entirely stopped the creeping and prevents evaporation, and it has also had the unaccountable effect of causing the zinc to remain very clean. Ordinary paraffin would probably be equally efficacious. After three months working there is no dirt whatever in the bottom of the cells, and the zinc is as clean as after two days' working without the oil, besides which the current appeared to be much increased. Probably leakage took place before the use of the oil. I make these cells up about once a month, each one with about a pound or a little more sulphate of copper, drawing off nearly all the zinc sulphate solution with a glass



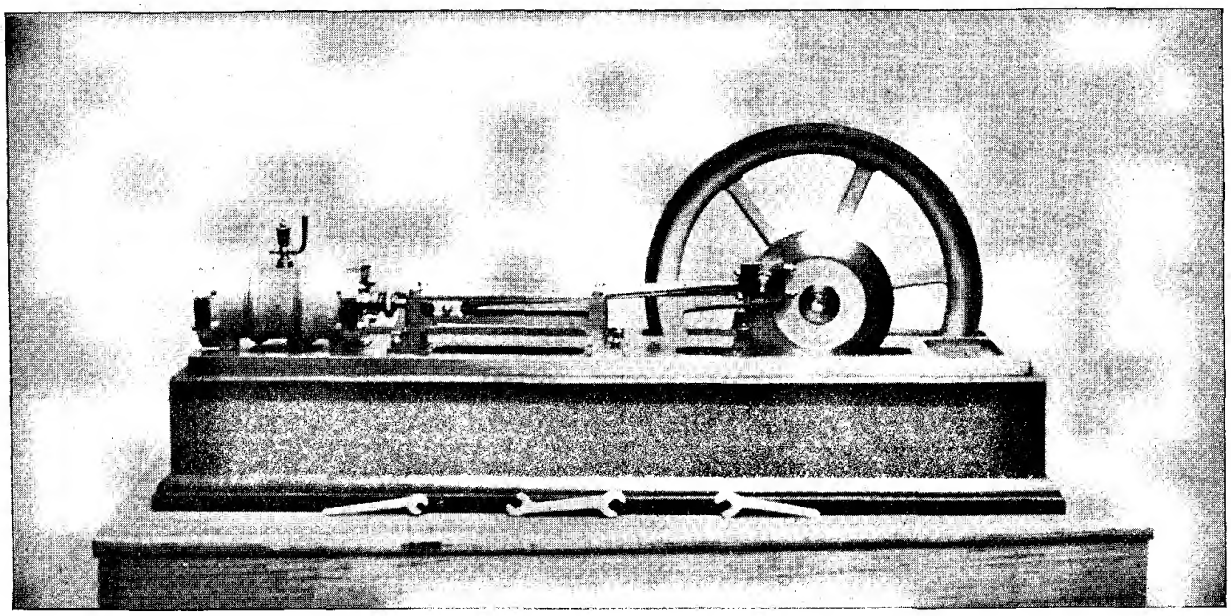
syphon, and filling up with water; and it is not necessary to look at them again for nearly a month.

These cells are always in circuit; but when I have been using very little current, and the accumulator has been pretty fully charged, I have switched them out, after allowing the copper sulphate to run very low, and let them stand for a week or a fortnight, and on one occasion for three weeks, and after replenishing the cells with sulphate of copper, they have started up, and been up to normal in about a quarter of an hour. The reason why they should not be out of circuit is due to the fact that the sulphate of copper solution rises above the zinc, and local action sets in, the zinc receiving a coat of copper. If the sulphate of copper is run down, this cannot take place.

I cannot give a definite statement as to the internal resistance or current on short circuit of these cells, but I should say the resistance might be about ½ an ohm.

Six cells will light a 4-volt lamp very well by themselves, and 12 cells charge my 8 volt accumulator well, in which there is always plenty of current stored. The cost is about 6d. a week for sulphate of copper.

The whole set are placed on the top of a high cupboard, where there is a small switchboard with galvanometer and two switches by the galvanometer. I can always test the batteries separately, and so ascertain if they are working all right. One switch cuts off the batteries from accumulator, and the other switches off the current from a double line of bare wires which I have put across the room, and from which by small trolley arrangements I can take off current at any part of the room, such as for experiments, working coils, or models, and for light for sewing machine. The bare wires are continued (insulated) through the wall to a bedroom for night light. The diagram on page 225 shows the original wiring, but it has been altered very considerably since I first fitted it up. I have also fitted up a set half the size for a friend, which rings electric alarm, works coils, model motors, &c., to the greatest satisfaction.



MR. S. L. THOMPSTONE'S MODEL HORIZONTAL STEAM ENGINE.

Design for a Model Horizontal Engine.

By S. L. THOMPSTONE.

THE drawings and photograph which accompany this article show a model horizontal engine, constructed by myself throughout. It took nine weeks of spare time to complete it, working about two and a-half hours each evening.

I give the dimensions, so that any of your readers who may feel inclined can make a similar engine.

Cylinder, 1 3-16ths ins. bore, 2 5-16ths ins. stroke. The bedplate is a gunmetal casting, 15¾ ins. long by 4½ ins. wide, 5-16ths in. round the outer edge, and 3-16ths in. in the plate, with cross stiffeners. Cylinder, 2 13-16ths ins. long, and 3 3-32nds over covers. Six hexagon headed nuts and bolts secure each cover. The cylinder is bolted down to the bedplate by two stout gunmetal 3-16ths-in. bolts and nuts, and the exhaust pipe by means of back nuts, which renders the cylinder perfectly rigid on the bedplate. The valvebox or steam chest is 1¼ ins. long by 1 in. wide, with screw stuffing-gland and preparation for steam-pipe.

The piston and valve rods are of silver steel, 3-16ths in. and ⅛ in. diam. respectively; connecting-rod of mild steel, 5 15-16ths ins. long between centres, connected to the piston-rod by a gunmetal knuckle-joint, and to the crankpin by a gunmetal marine connecting-rod end. The eccentric rod is of flat bar section mild steel, about 3-16ths in. by ¼ in., with steel knuckle-joint to valve rod, and screwed into eccentric strap the other end.

The crank-pin is 3-16ths in. diameter at the neck, and 9-32nds in. length between collars. Balanced disc crank 2⅞ ins. diameter, ¼ in. thick on the edge. Crankshaft 5-16ths in. diameter full, with ⅜ in. diameter boss through flywheel, and reduced to 9-32nds in. in the bearings. The eccentric is 15-16ths in. diameter, and 5 16ths in. travel, grooved for eccentric strap.

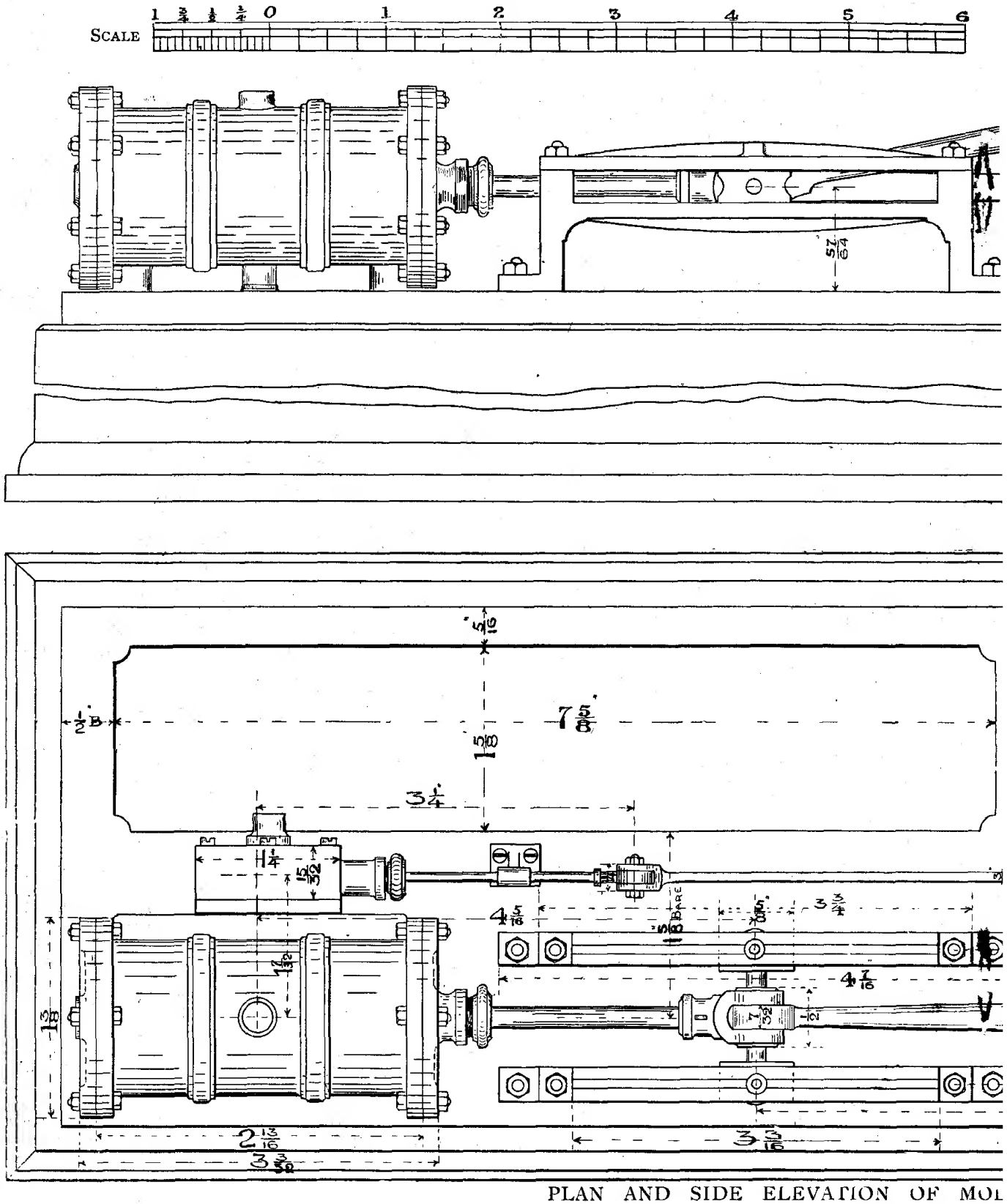
The flywheel is of gunmetal, 6¾ ins. diameter, 13-16ths in. wide on face, with six arms; pulley-wheel, 1⅞ ins. diameter and 1 7 16ths in., 2 speeds ¼ in. broad and V-grooved for cord driving.

The slide-bars and valve-rod guide are of gunmetal, and also the bearings, which are ⅜ in. thick.

From the centre of cylinder to centre of slide-bars is 4 5-16ths ins., centres between bearings 2⅝ ins., centre of cylinder to centre of valve chest 1 7-32nds in., centres between slide-bars 1 5-32nds in.

The engine is mounted on a stained wood box, 16½ ins. long by 5 ins. wide by 2¾ ins. deep and ⅝ in. in thickness. In the crank race under the bedplate is a polished brass box, which adds much to the finish. A single-cock lubricator is fitted in the top of the cylinder. The weight of the engine is 11¼ lbs.

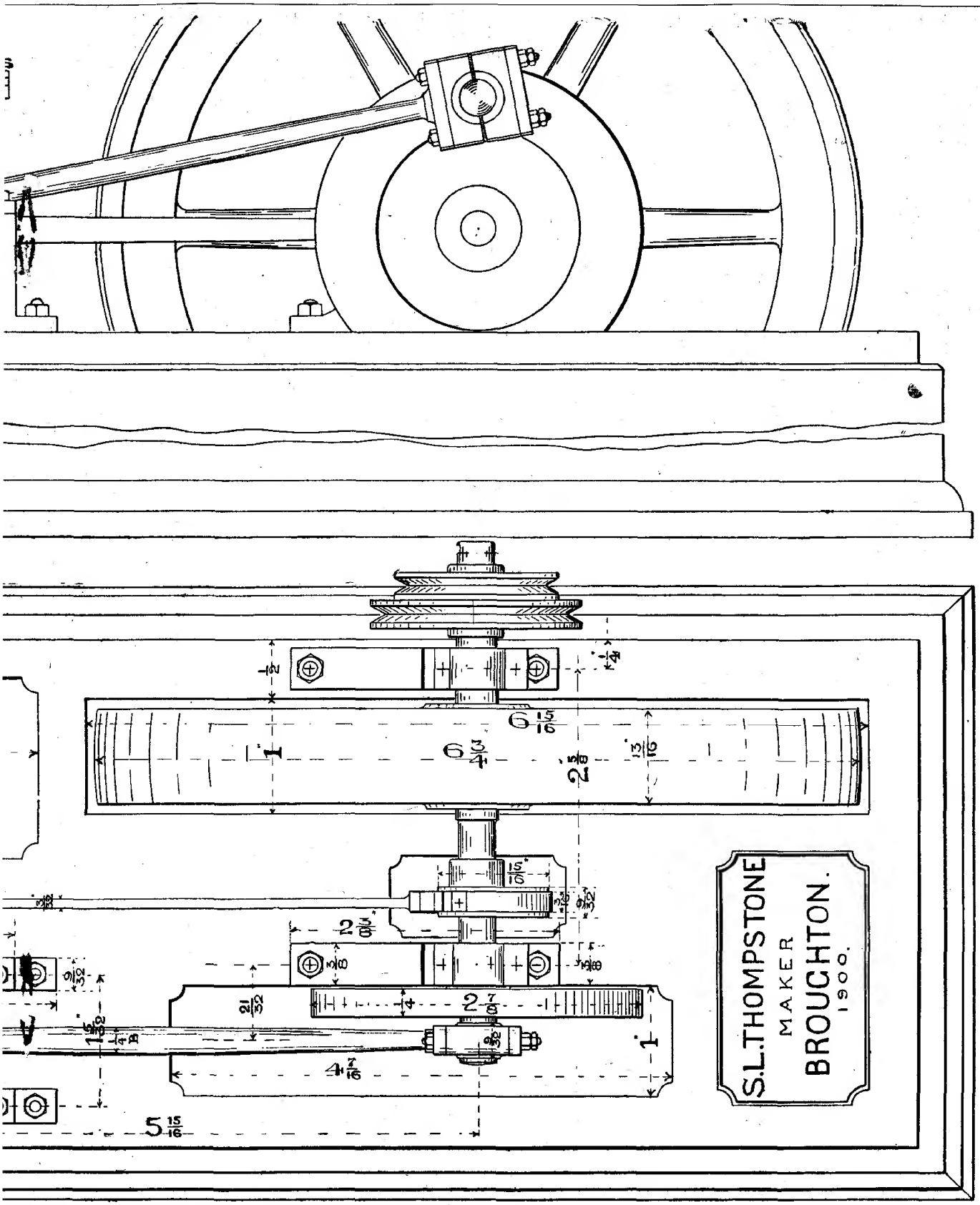
Many readers of THE MODEL ENGINEER who have difficulty in proportioning the parts of a model engine design will doubtless find the large drawing on pages 228 and 229 of assistance to them in this respect, the general proportions of this engine being very closely in accordance with modern practice.



PLAN AND SIDE ELEVATION OF MOL

By. S. L. THO

(For description se



MODEL HORIZONTAL STEAM ENGINE.

THOMPSTONE.

(For description see page 227.)

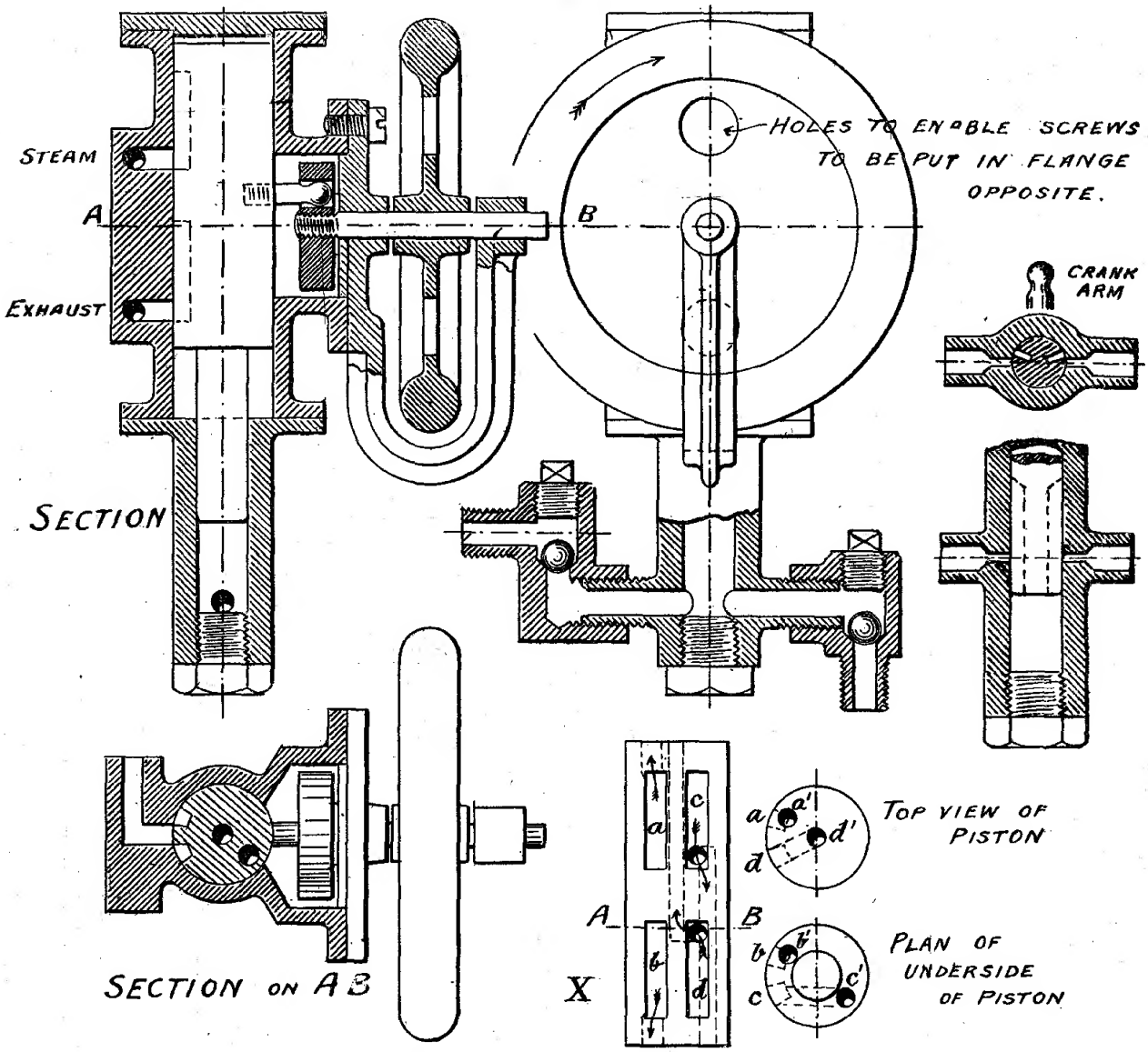
A Model Donkey Pump.

By GEORGE W. HALPIN.

NOW that water-tube boilers are all the rage, it becomes necessary to provide some means of keeping up the water level, and this, as well as the fact that it is a nice model to make, determined me to make one for my model steam launch. The type I fixed upon is that known to engineers as the "Dolphin," as it appeared to me to be easy to make, and have very little friction, there being no valve, guide, crosshead, connecting-rod, or eccentric, and in this particular specimen no stuffing boxes. The drawings, which are full-size, ought to show the construction very clearly, and if any other size be wished for, all that is necessary is to make a scale on paper, giving the required diameter of cylinder. The one in question is ½ in. diameter cylinder, ¼ in. pump plunger, with 5 16ths in. stroke.

The construction presents no difficulties, but care is necessary to have the cylinder and pump perfectly in line. I bored them separately, put the piston in the cylinders, then putting the pump body over the plunger, fixed the whole with a clamp, and drilled the screw-holes in place, and it came out all right. In making the cover with the bearings for the flywheel, I would advise making the bearing continuous, for convenience of drilling, afterwards cutting out the space for the boss of wheel. Of course, the whole is much better made a casting, as shown, but it is not absolutely necessary, mine being made of many pieces, the cylinder being of two pieces of brass tube, soldered together, and the flanges and steam ports also. The cover, with supports for flywheel, is made up of six pieces, and the wheel of three—rim, disc, and boss. The valves of pump were of the form shown, the valves themselves being spherical, made of bicycle balls.

The arrangement of steamways is not perhaps very clear to those who are strange to this type of engine, but they can readily be followed by the aid of the drawings.



DETAILS FOR MODEL DONKEY PUMP.

A back view of the piston (full size) is given at X, and on this the long steamways *a*, *b*, *c*, *d*, are shown full size, as though they were laid out flat (not foreshortened as they would be if correctly drawn). The space *a* connects directly to the top of piston by the hole a^1, and *b* to the bottom end by the hole b^1. In *d*, a hole is drilled direct to the middle of piston, whilst a hole d^1, drilled centrally from the top, meets it as indicated. Another hole is drilled askew in *c* (its direction can be seen in the plan of underside of piston), which meets a hole c^1 drilled upwards from the bottom end as close as possible to the plunger. By following out the course of the steam, it will be noted that the pump will run in the direction shown by the arrow on the flywheel.

My lathe is 3-in. single speed, and has no slide-rest. I may add that if care is taken in the fit of piston and pump no packing is necessary; mine has none, and is quite tight at 15 lbs. pressure, while I can easily blow it round. It should be mentioned that the pump, as here shown, has been slightly modified since the drawings were made, owing to the fact that the valves were more trouble to make than was necessary. As a result, this portion was modified to a certain extent, as shown in the sectional elevation and plan drawing at right-hand side of pump drawing. The plan shows the plunger (in which the two slots have been cut with a saw) at either top or bottom of stroke, the crank-pin being in position shown. The vertical section shows the plunger at the top of its stroke. With this arrangement, of course, no valves are required at all, the saw-cuts in plunger acting just like the grooves in piston, the partial revolution of which on its axis during each stroke causing the suction and delivery inlet to be alternately brought in front of the grooves shown. It will be noted that the bores of both suction and delivery are reduced so that they just equal the width of the slot. So arranged, the pump is extremely neat, and quite self contained.

City of London College Science Society.

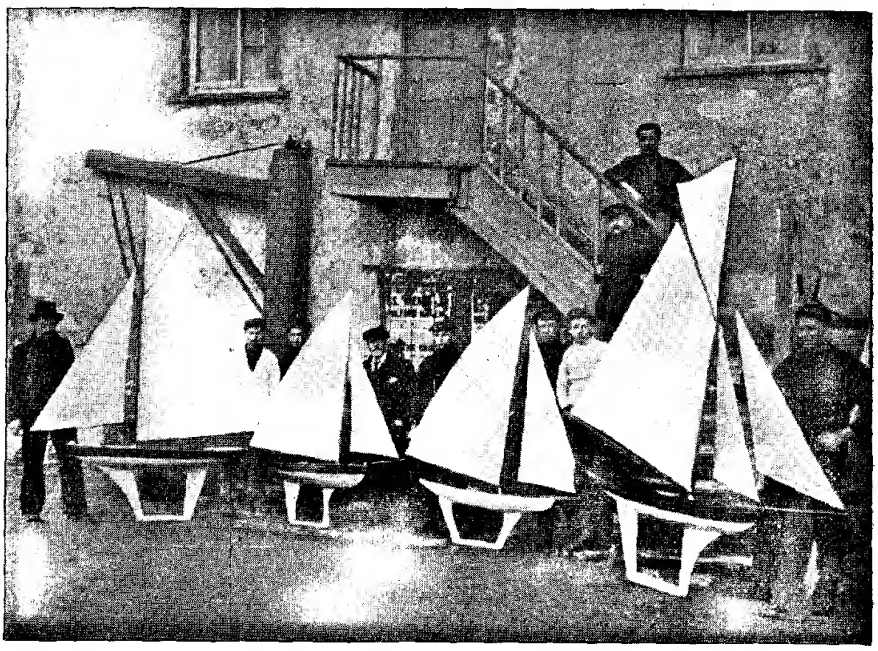
We are informed that this Society will undertake a new venture this year in the form of two cycle runs, which will be to places that can be reached by train, to enable those who do not cycle to join the party at the rendezvous. It is proposed to have the first one on Saturday afternoon, May 18th, to Epping Forest; starting from Waltham Abbey (sufficient time being allowed to visit the Abbey and Cross—and under direction), then walk to Chingford *via* High Beech and the most interesting portions of the Forest; taking tea *en route*; the visit terminating with the inspection of the Forest Museum at Queen Elizabeth's Hunting Lodge and Ancient Grand Stand. Will all those who have an intention of going kindly send in their names to the Hon. Secretary, Mr. Gray, at the address given below? These runs are open to all students and members of the College, as well as their friends; but those who are not members of this Society will be charged sixpence each to cover cost of notices, postages, etc.—H. Norman Gray, Hon. Secretary, City of London College Science Society, White Street, Moorfields, E.C.

Model Yachting Notes.

[The Editor will be glad if the Secretaries of Model Yacht Clubs will keep him advised of all doings of interest suitable for insertion in this column.

Model Yachting at Tenby.

Mr. W. Noble, Commodore of the Tenby Model Yacht Club, sends us a photograph of four of the boats of the Tenby Model Yacht Club which took part in a race on Boxing Day, with a strong wind N.N.W. To quote Mr. Noble's own words:—"The race was for a very handsome silver-plated cruet, to be won three races in succession, or five times in all. The result of the first four races is:—W. Noble's *Ibex*, two races won; Mr. S. Parnell, one race; Mr. R. Jones' *King Ja Ja*, one. The conditions of the race are as follows:—½ mile dead to leeward and a beat back; two rounds. The last race was completed in 1 hour 1½ minutes.



Four Yachts of the Tenby Model Yacht Club.

The men you see in the photo are the owners and those who pull in the boats after them; for we sail in the open sea, and each model yacht requires a boat and three men—two to pull and one to sail the yacht. They are just come in wet, and a bit fagged, after the race. I may say, in conclusion, Tenby is a very pretty watering place, and a good many visitors come here in the summer. Any of The Model Engineer readers who have models, and are coming to Tenby for their holidays, if they bring their boats, we shall be glad to let them sail under our club rules."

The New Measurement Rule of the Cardiff Model Yacht Club.

The second race of the Cardiff Model Yacht Club, which took place on the Roath Park Lake recently for a cup presented by the President (Councillor R. Hughes, J.P.) was specially interesting, in that it was sailed under the new measurement rules of the club. The conditions were that the cup be won three times by the same person, not necessarily in suc-

cession. The rule of measurement is 1·6th overall length to be maximum draught, 1·5th overall length to be maximum beam, any excess to be added to water-line, together with half the overhang. The total makes the water-line length with a handicap of 20 secs. per inch water line. Mr. W. H. Smith was starter and referee, and the race opened at 4.35 p.m. with *Secret*, 50¼ ins.; *Ida*, 50½ ins.; *Dodger* and *Ivor*, 51½ ins.; *Mavis*, 52¾ ins.; *Baden-Powell* and *White Rose*, 54 ins.; *Bobs*, *Kindly Light*, and *Camel*, 55 ins.; *Scillonian*, 55¼ ins.; *Gloria*, 58½ ins.; *Caress*, 60¼ ins. On crossing the line for the second round the positions were:—1, *Secret*; 2, *Ida*; 3, *Ivor*; 4, *Mavis*; 5, *Baden-Powell*. On the completion of the last round the yachts crossed the line in the following order:—1, Mr. Jones's *Secret*; 2, Mr. Page's *Ivor*; 3, Mr. A. Llewellin's *Gloria*; 4, Mr. R. Thomas's *Baden-Powell*; and 5, Mr. Hancock's *Ida*. Time, 50 mins.—W. H. SMITH, Secretary, 51, Clive Street, Grange, Cardiff.

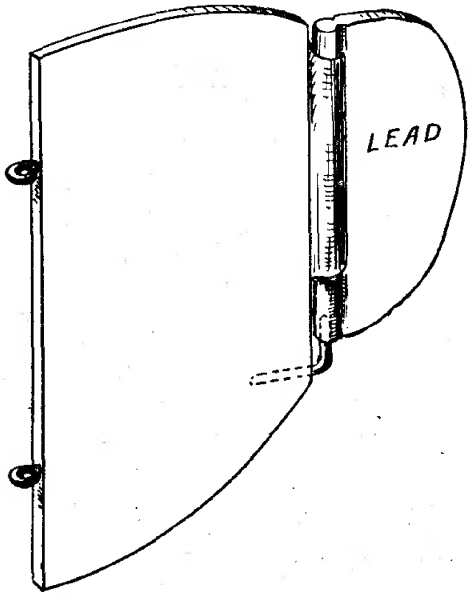
Model Yachting Correspondence.

[*The Editor invites readers to make use of this column for the full discussion of matters of practical and mutual interest. Letters may be signed with a* nom-de-plume *if desired, but the full name and address of the sender should invariably be attached, though not necessarily intended for publication. Communications should be written on one side of the paper only.*]

Model Yacht Steering Gears.

TO THE EDITOR OF *The Model Engineer*.

SIR,—I have been much interested in the correspondence on the various methods of steering model yachts. Some of them are very ingenious, and require much skill and thought to work out. My father used the weighted



tiller over sixty years since, also steering by main sheet; the weighted tiller is very effective sailing to windward, but sufficient weight cannot be got when running. I have tried the various methods of steering, but none seem so effective as the series of weighted rudders, the size and weight being made to suit the model for her various points of sailing. Four rudders are sufficient with most yachts; Mr. Bruce, the editor of the *Model Yachtsman*, advocates this type of rudder. I have used a rudder (swing) fitted to the stern-post with a metal slot, into which lead weights are fitted to suit the course or wind; it is very effective, and the swing rudder is always fixed in its place. The simpler the arrangement the better. I have sailed models and built and fitted them for over forty years, and consider weighted rudders a most important part of a model's outfit. We use weighted or lead rudders on all our models, as in sketch, which shows how the lead is attached, the top of a penholder being fixed to rudder, and lead grooved to slide into the slot. A pin is fitted at bottom to carry the lead. The courses kept by the cutters and yawls leaves little to be desired; the fittings and sails are simple and effective.

We are expecting a lively season at Lowestoft, as there are two challenge cups to sail for, and several new models built and others improved for the coming season. We hope some of the new London club boats will pay us a visit to test our boats; the members here are always ready for a friendly contest with model yachtsmen from other clubs. F. J. TANSLEY, L.M.Y.C.

Lowestoft.

Miniature Model Yachting.

TO THE EDITOR OF *The Model Engineer*.

DEAR SIR,—"Little Man's" letter appearing in your issue of April 15th, is, if I may be pardoned for saying so, typical of the great country whence it emanates. One may possess a very fair size model yacht, "under 40 ins."—39·99 in., say—but that, or anything approaching it, is not the dimension I had in mind when penning the original letter on miniature models, as I think was shown.

Let "Little Man" and his *confrères*, if they will, experiment with yachts (not toys, I would again emphasize) about 12 ins. or less in length over all, and I believe they will find them demanding more skill in racing, and affording more pleasure upon small sheets of water than ever obtains with larger boats. The reason is that as the models are made smaller, lighter, and daintier in every respect, the operations of sailing them with effect becomes, of necessity, refined in the extreme. One must needs put brains rather than muscle in such work, and wield a wand instead of a boat hook.

The two yachts, *Beatrice* and *Nordica*, are very workmanlike craft apparently. It is a pity, however, that their chief measurements and performances are not given, for, by comparison with those of our models in Britain, some idea of their real excellence could be obtained.

By-the by, I fancy many of your readers (I being one) hear of "linenoid" for the first time through "Little Man." Will he, or others who know, favour us with particulars of the material?—Sincerely yours,

Wealdstone. D. W. G.

AN instrument to which considerable interest attaches has been devised and described by M. T. Tommasina. Its object is to detect distant thunderstorms. The apparatus consists essentially of a self-decohering carbon coherer placed in circuit with a dry cell and an ordinary telephone receiver. The grains of carbon are hermetically sealed in a glass tube attached to the telephone magnet, so as to lie horizontally when the receiver is placed to the ear. The impression produced upon the observer is that of being transported into the neighbourhood of the thunderstorm which might yet be hidden below the horizon. To strengthen the effect the author used three copper "antennæ," each 30 mm. long. In this manner it was found possible to observe the development of a violent thunderstorm at a distance twelve hours before it broke loose at the observing station, which was situated on the Lake Maggiore. A distant rain is indicated by a rattling sound before a cloud is visible.—*The Engineer*.

The Editor's Page.

WE append below some further correspondence on the subject of the supply of up to-date models, and also some letters relating to the mutual courtesies between the trade and their customers. We think both these subjects have now been fairly well ventilated in our columns, and may be allowed to drop, for a time, at any rate.

* * *

From Messrs. Drake & Co. (formerly the Model Supply Company) we have received the following:—"We have been much interested in the correspondence in your page of the recent issues of THE MODEL ENGINEER *re* 'Up-to-Date Models at a Reasonable Price.' What do your correspondents say to an up-to-date scale working model American loco, 3 ft. 3 ins. long, for £18? This is surely a reasonable price for the enormous amount of work in the engine and boiler. We note also that some correspondents ask for up-to-date designs of stationary engines. We are open to make the following offer:—If any six readers agree to make any type of engine, we will undertake to supply castings at a reasonable price. One of your correspondents stated that he wished to purchase a model of a passenger steamer, such as the one described by 'Sardonyx.' Does the reader think one could be built in, say, two hundred hours? This at 1s. per hour (a low price reckoning wages, rent of works, fuel, gas, &c.) comes out at £10. Would he call this a reasonable price? We rather fancy most of the writers have not gone into the prices in this way. There was some little time ago some correspondence *re* lists, and charging for same. We enclose a card, which, we are pleased to say, we do not receive every day, but which come rather frequently on similar requests. One penny stamp was enclosed with this sample, and his wants were quite moderate for the sum enclosed."

* * *

The card referred to in the above letter runs as follows:—"Kindly send dimensioned drawings of 1½-ins. bore by 3 ins. stroke horizontal engine with your catalogues." Messrs. Drake & Co., in forwarding this to us, add: "It is not much to ask for complete dimensioned drawings for an engine of this size for one penny, in addition to lists costing about 4½d. to produce, besides postage. We sincerely hope that the writers of the correspondence referred to above are more reasonable in their wants."

* * *

"W. R. D." (Aberdeen) writes:—"In reference to your remarks, and also those of 'Demand and Supply,' in the March 15th issue, I may say that I would be quite agreeable to buy a maker's standard patterns, but in your 'Queries and Replies' Column I see certain conditions as to the sizes of locos, which you advise a questioner to use, and which would make up a good loco. In the maker's catalogue some of these conditions are violated, and as I believe you to be an expert in these matters, I naturally think that if locos are not made to proportions as given by you, they cannot be very good. So I wish to have the loco changed to fulfil your conditions. I would not like to buy a loco which has something in it in direct opposition to your advice to readers." While we appreciate our correspondent's good opinion of our advice on the proportions and details of construction of locomotives and other models, we would point out that our recommendations in reply to queries are usually made to fulfil some special requirements on the part of the reader asking for the information. It does not follow, therefore, that because an engine offered by one of our advertisers does not correspond in dimensions or arrangement with the specification we give in reply to a reader's query, that it will not be a good working model. It may have been designed for very different working conditions, or may be offered at a price at which the construction advised by us could not be carried out, and should therefore be judged on its own merits, and not by comparison with a specially designed engine.

* * *

"S. M. L." (Canada) writes:—"I was glad to see 'C. J. E.'s' letter and those of other amateurs *re* up-to-date models, &c. It is high time that the model-making trade brought out new castings. I am sure amateurs are very tired of the old-fashioned designs. Cannot some one keep in stock castings for small *scale* loco models? I have been looking for a set of L. & S.W.Ry. castings, ½-in. scale, for some time; no one keeps them apparently. Dealers, with few exceptions, seem to have nothing but old style, clumsy, disproportionate models. One London firm have large loco. scale models; but these are rather too much of a contract for an amateur with a small lathe, etc. Another point—fittings for model boilers—as far as I can ascertain, the smallest taps are of such a size as would make them look well on, say, a ½ horse-power boiler; there do not appear to be any cocks or gauges to suit ⅛ in. piping. There is room for improvement in this line."

* * *

The Universal Electric Supply Company (Manchester) write:—"In your issue of April 15, under 'Editor's Page,' we notice a complaint from 'Business Man.' As we are *constant advertisers*, and as we also issue a catalogue, we would be glad to know whether his complaint applies to our firm. (No.—ED. *M.E.*) If he does refer to us, may we inform you that all our goods are accompanied by a printed 'delivery receipt form' in duplicate? This answers the first remark. As regards the second remark, is there not the possibility that in sending a parcel back 'Business Man' perhaps forgot to address it? We would not trouble you with this letter, were it not for the fact that so many people like to rush into print before they are justified."

* * *

"H." (Oxford) writes:—"Tradesmen who advertise in your columns may complain; but customers have an equal right, judging from my own experience. Last November I wrote to four of your advertisers (all except one in the current number) for a copy of their price list, enclosing 3d. to 6d. stamps in accordance with terms of the advertisement. Only one sent his by return of post, and I had to write again to the others, two of whom,

after more or less delay, sent theirs. The fourth and, I imagine, not the least known of the four, being in business not 1000 miles from (let us say) Oxford Street, have neither sent me a copy of their price list nor returned me the 6d. stamps for which they asked as its price, and which I sent them November 25th. In December I wrote and asked either for the catalogue to be sent or the stamps to be returned, and had a reply that the catalogue was out of print, but that a copy would be sent when printed. Since then I have written twice for the return of my stamps, but have received no reply at all, although close on six months have passed since they were sent. I hope, Sir, in the interests of both parties, you will give publicity to this matter."

Practical Letters from Our Readers.

[*The Editor invites readers to make use of this column for the full discussion of matters of practical and mutual interest. Letters may be signed with a* nom-de-plume *if desired, but the full name and address of the sender should invariably be attached, though not necessarily intended for publication.*]

High-Pressure Boilers for Model Torpedo Boat Destroyers.

TO THE EDITOR OF *The Model Engineer*.

DEAR SIR,—It was with a curious mingling of amusement and incredulity that I read the wonderfully practical and scientific treatise by our friend, "E.," of Liverpool, on water-tube boilers in particular, and high-pressure boilers for model torpedo boat destroyers in general.

Taking the different points, practical recommendations, etc., as they occur in the article, permit me to offer my criticism for the benefit of those readers who might feel inclined to make one of the boilers shown, and who are not endowed with the truly astonishing experience of our friend "E."

1. Leaving Mr. Morriss's boiler out of the question, and taking "E.'s" boiler on its own merits (?), then anyone who has had even the slightest experience in actually making these small boilers, will know what an awkward job it is in fixing tubes in a tube plate at an angle as shown on the sketch. It's very easy on paper, but if "E." ever made a boiler himself he will no doubt agree with me that it is simpler and better to fix the tubes at right-angles to the plates—this especially applies if the tubes are to be brazed with silver, as in that case it is absolutely essential that they should be a perfectly correct fit all round. Therefore, the practical way of getting over this difficulty is to slant the tube plates at the same angle to the vertical as the tubes are to the horizontal line, as, for instance, in the Babcock and Wilcox boilers.

2. Lamphole.—This is given as only ½ in. diameter, which is far too small for a blowlamp or anything else. It is a ticklish job, at the best of times, to get sufficient air to the flame and burner without sticking it into a boiler casing having only a ½-in. hole and no other means of bringing fresh air to the flame, as "E." gives no information at all on this point; or, does he expect the forward funnel will do that? Surely not.

3. Casing.—How is this made, what of, what kind of insulation is used? &c. The drawing only shows a single thickness of sheet metal, which is quite insufficient to prevent excessive radiation, and would burn and scorch a boat in no time. If it is intended to be lined with asbestos, then this will run up the weight of the boiler as a whole considerably. Has "E.," in his "very careful consideration," taken account of this? If so, then his estimated weight is wrong. I absolutely defy him to make a boiler as per his illustration, properly lagged with fittings on, and water at working level, to weigh only 4 lbs. The consideration of weights is of vital importance in building any boats of such light displacement as destroyers are as a rule.

4. Baffle Plates.—Hot air or furnace gases will seek the shortest way to the funnel mouth. To enable them to do this the opening between the baffles is very considerately placed right over the body of the rising flame and heat. From the way the plates are arranged they give short circuit to the after funnel, and the efficiency of the lower ends of the tubes is thus lost, or at least greatly impaired. By using one long baffle plate, and leaving the opening the same as shown on sketch, and right up against the large drum, the heating surface of the tubes would be utilised to better advantage, as then the heat will have to creep along practically the whole length of tubes before being able to escape. This is actually done in the Haythorn boiler.

5. Circulation.—The reasons given by "E." as to the circulation being improved by making the water drum (for such it really is) larger than the steam drum are not only wrong, but miss the point altogether. There is not a single type of water-tube boiler on the market where the water drum is larger than the steam or separating drum — not even in the Hornsby boiler, which is about the nearest approach to the one in question, as it has flat boxes to take the tubes. Any ordinary model engineer amateur will know that water on being heated will rise, the surrounding cold water flowing down towards the source of heat, thus setting up circulation, which in a water-tube boiler, and especially one with small tubes, is greatly increased—in fact, forced—by the water in the tubes being rapidly converted into steam, and thus rushing with great violence up into the steam drum, carrying a considerable body of water with it as well. Now, when this mixture of steam and water gets into the small drum "of E.'s" boiler, and the water separates from the steam, how is he going to bring it back to the bottom of the water drum and to the lower end of the tubes, as the natural tendency of the steam and water is to rush up into the small drum? The fact is, "E." has forgotten all about the downcomers, which to a water-tube boiler of this type are essential for steady steaming and circulation; for without the one the other cannot exist. Of course, I am perfectly aware that there are water-tube boilers without down pipes, and that under certain conditions water will flow downwards in the tubes exposed to the fire, as has been demonstrated by Mr. Thorneycroft in his experiments, but these cases do not apply to this style of boiler.

6. Steam Pipe.—This is in the wrong place, as the greatest amount of steam will accumulate in the small drum for reasons as stated above. The proper way to connect the two drums would be to put about half-a dozen of tubes near the top. These tubes take the steam over to the big drum, acting on the way as super-heaters as well, and so effectively drying the steam. To obtain an even supply of steam there must be a connection between the two drums near the top, or else the small drum would be worse than useless, as it will form a pocket, and so trap the steam, instead of separating and collecting it, and so to allow the priming pipe in the large drum to reap the benefit of the rapid circulation of the water over the heating surface due to inclining the tubes.

I do not mean to say that the boiler if made to "E.'s" design would not steam; far from it; almost anything will steam, even a tea-kettle with water in it; but what I wish to point out is this—that without the modifications mentioned above, the boiler, as a fast steamer, will be a lamentable failure, and defy the very object of its existence, that is, quick and steady steaming on light weight.

Theories and experience gained by partial glimpses of what is going on elsewhere, are apt to give an amateur boiler-maker much disappointment if written in such an authoritative style as "E.'s," especially so if the writer has not gained his experience by making a boiler himself.

I shall be glad to hear the opinion of those correspondents who are, from their own practical experience, competent to discuss this subject.—Yours truly,

Liverpool. "NAUTILUS.'

Fuel for Model Engine.

TO THE EDITOR OF *The Model Engineer.*

DEAR SIR,—Seeing several suggestions for the above in your valuable pages, I now send you particulars of the method I have devised, and which has proved itself successful. Soak half-burned coal in turpentine, shovel it into firebox, and apply a light. This fuel has a very lasting and strong flame.—Yours truly, W. BRAIN.

Lambourn.

A Model Babcock and Wilcox Boiler.

TO THE EDITOR OF *The Model Engineer.*

DEAR SIR,—As there appears to be considerable demand for a model boiler of good power, occupying small space, and within the scope of the ordinary mechanic, I offer you the following designs adapted from the "Babcock and Wilcox" type of boiler.

The tubes in this boiler should all be of copper, and in the sketch (Fig. 1) the headers A and B are both of ½ in. tube, flattened to ⅜ in. from X to Y, while the top ends of front headers B are screwed into the steam drums and soldered. The back headers can only be soldered. The small water tubes W are screwed with a fine thread at both ends, and entered sufficiently into the front headers B to admit of turning back into the others. Each end is soldered with a blowpipe as it is fixed. Screwed plugs P are fitted to the bottoms of the headers, those in the front being also used to secure the boiler to a foundation, while the back need only

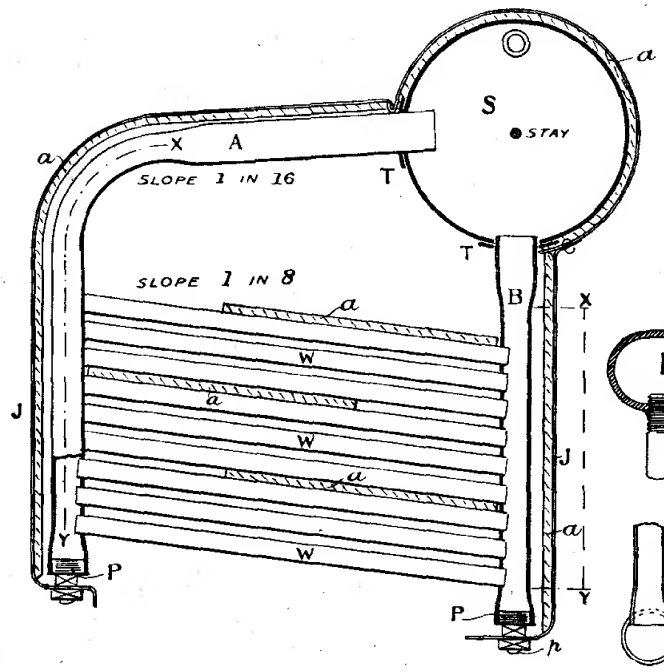


FIG. 1.

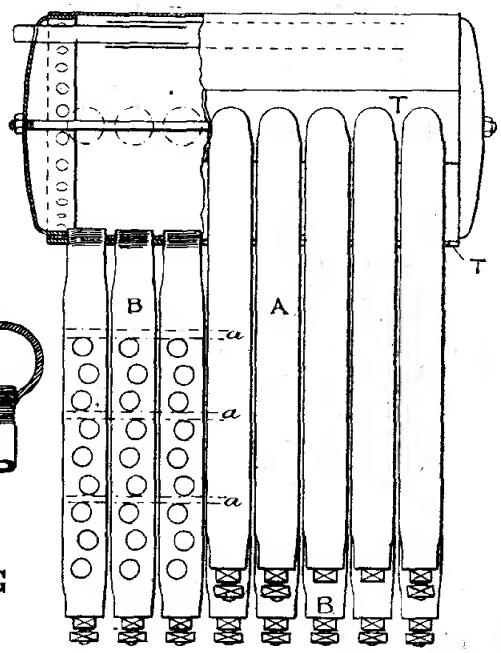


FIG. 2.

MODEL BABCOCK AND WILCOX BOILER.

The Price of Small Bolts and Nuts.

TO THE EDITOR OF *The Model Engineer.*

DEAR SIR,—In your April 1st issue I read with interest a letter on the above subject by "Hexagon." I quite agree with him as to the high prices for small nuts and bolts, &c. I went into a model supplies dealer the other day and enquired the price of some bolts ¼ in. long. Price 1½d. each, nuts ½d. each, making a total of 2d. for each complete nut and bolt.

The dealer said that he *could* let me have the bolts alone at about 9d. per dozen, nuts still at ½d. each. This would be rather costly in making a model loco, for instance.

If some enterprising model engineering firm put the complete bolt and nut on the market for about 1d. each, they would do well.

I have taken your paper regularly since March, 1899, and I like it immensely.—Yours, &c., OCTAGON.

rest upon a support. These plugs may be made, for example, as shown, with a screwed tail end *p*, to which a nut is fitted, and they may then hold the sheet-iron casing J, to which a firegrate and ashpan can readily be fitted. In the sketch the plugs of the back headers A are shown also made in the same way. There would be no need to make all the plugs serve this purpose, and in Fig. 2 the two end and two middle ones only are of the special pattern.

The steam drum has one stay from end to end—say, 3-16ths in. diameter, and an internal steam pipe, into which the ends of the main and auxiliary steam pipes are entered, as in Fig. 2. The tube space is surrounded by a light casing, J, lined with ⅛ in. asbestos, *a*.

A boiler of this make has been pressed to 200 lbs. per square inch, and with eight elements and dimensions over all of 8¼ ins. by 8 ins. by 5½ ins., almost the same as here described, has a direct heating surface of 170 sq. ins.

An addition may be made of a ¾ in. horizontal tube, into which the lower ends of the front headers are screwed. This slightly improves the circulation and efficiency, but does not admit of the front headers being cleared so readily. The arrangement is shown in section at G, Figs. 1 and 2.

If anything in the nature of a blast lamp is to be used, a sheet of ⅛ in. asbestos should be inserted above the lower three layers of tubes, extending two-thirds along the front end, another above six layers, but to the back, and again in the front, at the top of the tubes; this can be seen in the drawings. The following details may also be noted in the drawings—namely, thickening strips T rivetted to steam-drum for more securely holding the header tubes; and dished ends (shown in section, Fig. 2) for steam-drum. A full-size section F is also given of the flattened part of header tube, with small tube W screwed in. All the other drawings are one-third full size.

Another design, Figs. 3 to 6, is simpler to make, and more suitable for a model steamboat. In this case the headers are in two layers, and only the top and bottom small tube need be screwed in each header, the others being of light make and soldered only. Each header is provided with six small tubes. The drum has two light longitudinal stays, and is altered to a saddle formation at the front end. With dimensions over all of 6¾ ins. by 6¼ ins. by 2 ins., it gives 62 ins. of direct heating surface, and can be worked at 40 lbs. pressure per square inch.

I am certain that any of your readers who take the trouble to construct either of these boilers will not regret it, and hope my information will meet the want expressed by several lately.—Yours sincerely,

Devonport. "WATER TUBE."

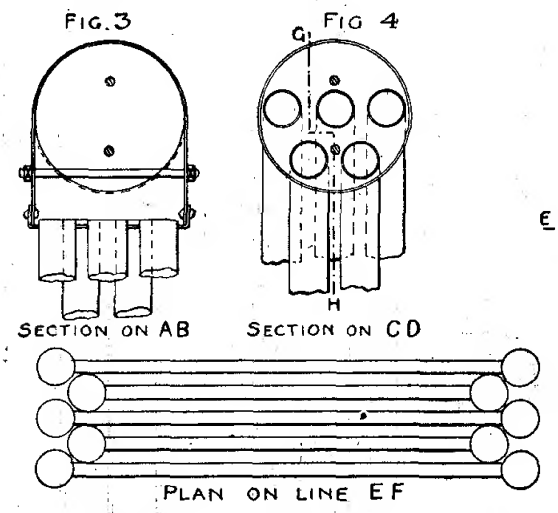


FIG. 5.

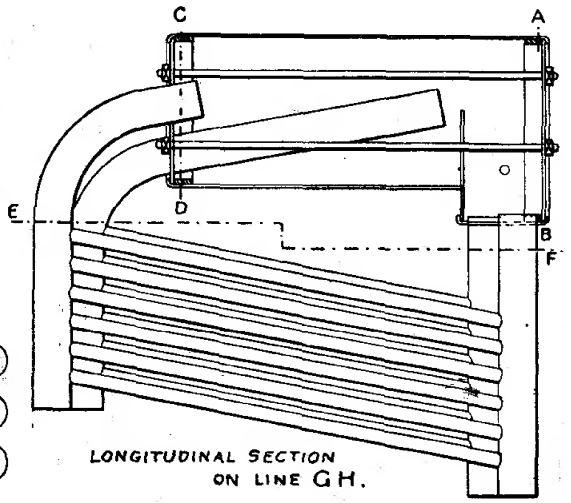


FIG. 6.

MODEL BABCOCK AND WILCOX BOILER.

The Lubrication of Turning Tools.

TO THE EDITOR OF *The Model Engineer.*

SIR,—For those who may not care to take the trouble to make the apparatus described by Mr. Frazer in the issue for January 15th, I describe a very simple device which I use. Get an ordinary bicycle oil-can, having a bent spout about 3 ins. long. They are quite common, and sold for 2½d. or 3d. This is supported by a piece of hard wood, very much like a clothes peg, but with its prongs wide enough apart to grasp the oil can. It should be fixed to the tool-holder or slide-rest in an upright position, and be capable of turning on its axis. The body of the oil-can is placed in a horizontal position between the prongs, with the spout immediately over the cut the tool is making. The can being filled, the drip can be regulated by raising or depressing the spout. But little oil is wasted, as, for most work, all that is wanted is sufficient oil dripping to vapourise on the work, very little falling below. Of course, this is only suitable for small lathes; mine is 4½-in. centres.—Yours truly,

Cheshunt. C. F. S.

Improving a Model Loco Boiler.

TO THE EDITOR OF *The Model Engineer.*

DEAR SIR,—The means of increasing the heating surface of a crudely-made model locomotive boiler, suggested in a letter on p. 186 by Messrs. Drake & Co., is certainly an ingenious one; but your correspondents may be interested to know that they are not the originators of it. Several years ago—during the later "eighties," I believe—a similar device was described in the *Boys' Own Paper* by Mr. H. F. Hobden. In this case, if I remember rightly, the insert was situated in the fore end of the boiler, and an uptake connected it to the chimney. It is, undoubtedly, the best method of improving the steaming quality of a toy loco boiler that can be devised. But they are, indeed, sorry articles.—Sincerely yours,

Wealdstone. D. W. G.

Construction of a 4-in. Spark Coil.

TO THE EDITOR OF *The Model Engineer.*

DEAR SIR,—I have seen in the issue of THE MODEL ENGINEER of March 1st the description of a 4 in. spark coil. The primary winding is indicated as 1 lb. of No. 14 D.C.C. I have tried to construct such a coil, but have found that the quantity of primary wire is too little. I had bought about 1½ lbs. of No. 14 wire, thinking I had more wire than necessary, but I found that 1½ lbs. of No. 14 wire D.C.C. is insufficient to wind three layers on a ⅞-in. core over a length of 7 ins.—Yours truly,

Genoa. A. GANDOLFI.

[With very tight and even winding it would be possible to get 1½ lbs. of wire on the core, as our correspondent states; but 1 lb. is sufficient for "average" winding. It is, of course, always advisable to provide a little more wire than is theoretically necessary, as the net quantity may not quite finish the winding of a layer, or the amateur may be a more careful worker than the average.—ED. *M.E.*]

Improved Needle for Model Electric Telegraph.

TO THE EDITOR OF *The Model Engineer*.

DEAR SIR,—I made a model telegraph to the instructions found in THE MODEL ENGINEER, March 15th and April 1st. When I had got it all complete, I found that the needle, made out of a watch spring, would not hang straight; but after a little consideration, I thought of making it a little heavier at the bottom, and leaving it light at the top. I took a piece of sealing-wax, melted it, and put a little on the back of the needle at the bottom, and this, I find, answers the purpose very well.—Yours truly, ELIAS J. LINTINE.

Birmingham.

Queries and Replies.

[Attention is especially directed to the first condition given below, and no notice will be taken of Queries not complying with the directions therein stated.

Queries on subjects within the scope of this journal are replied to by post under the following conditions:—(1) Queries dealing with distinct subjects should be written on different slips, on one side of the paper only, and the sender's name should be inscribed on the back. (2) Queries should be accompanied, wherever possible, with fully dimensioned sketches, and correspondents are recommended to keep a copy of their Queries for reference. (3) A stamped addressed envelope (not post-card) should invariably be enclosed. (4) Queries will be answered as early as possible after receipt, but an interval of a few days must usually elapse before the Reply can be forwarded. (5) Correspondents who require an answer inserted in this column should understand that some weeks must elapse before the Reply can be published. The insertion of Replies in this column cannot be guaranteed. (6) All Queries should be addressed to The Editor, THE MODEL ENGINEER, 37 & 38, Temple House, Tallis Street, London, E.C.]

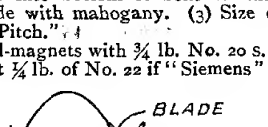
The following are selected from the Queries which have been replied to recently:—

[3653] **Gas Engine Exhaust.** E. H. (Forest Gate) writes: Do all gas engines have cams to open exhaust-valve, thus losing power in back pressure? What would be fraction of horse-power to open exhaust of a 10 h.-p. gas engine?

All large gas engines have cams or similar contrivances, but in many cases the valve is of a balanced pattern, so that very little loss of power takes place in opening the valve. In any case, the amount of power required is very small compared with the output of the engine, but it would be quite impossible to say exactly what would be required by an engine, no particulars of which are given.

[3674] **Motor for Boat.** A. E. G. (Brixton) writes: Will you kindly forward me answers to the following? For a boat 5 ft. long 10 ins. wide, 12 ins. deep, twin screws, two motors (one motor for each shaft). (1) Size and quantity of wire for fields and armatures. (2) Accumulators to fit into bottom of boat as ballast to work both motors; to be made with mahogany. (3) Size of propellers and meaning of word "Pitch."

(1) Wind the field-magnets with ¾ lb. No. 20 S.C.C. wire and the armature with about ¼ lb. of No. 22 if "Siemens" H, or No. 24 if a



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slotted drum. (2) The accumulator could be similar to that described in chapter III in "Small Accumulators," having three or four cells with five plates in each (two positive and three negative), about 6 ins. square. (3) Propellers, 3 ins. diam. and 4 ins. pitch. The "pitch" is the distance along the shaft one blade would be continued to make one complete turn.

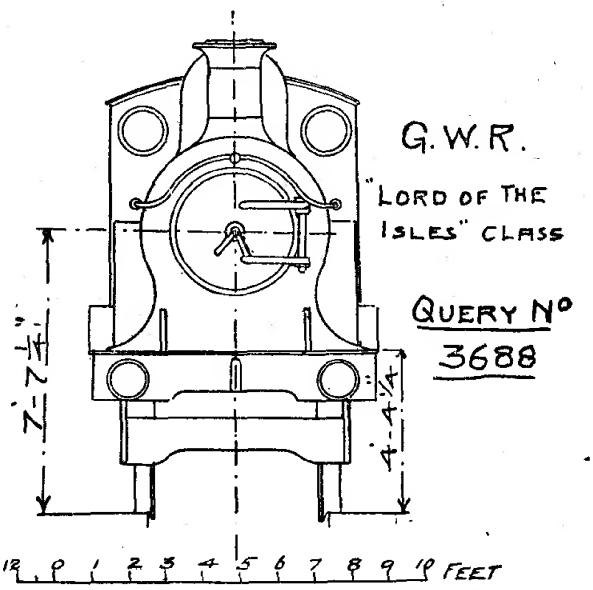
[3715] **Vertical Boiler.** T. H. W. writes: Will you kindly send me drawings and particulars of a vertical steam boiler to supply steam to a horizontal engine of 1 in. bore of cylinder, and 1¾ ins. stroke? Please give dimensions, and also show where to place fittings?

The design for vertical boiler shown and described fully on pages 30-36 of "Model Boiler-making" (post free 7d.) will be suitable for your engine.

[3716] **Dynamo to Run a Motor.** F. W. S. (Dublin) writes: Will a dynamo with H Siemens armature drive a 3-pole armature motor, as I have a dynamo as above, but it will not drive a small 2-volt tripolar motor? The dynamo will light lamps and other work; it is a 16-volt 2 ampère one. Would you kindly tell me if anything is wrong with it, and if a cogged drum armature be the one for it?

The dynamo will not work the motor owing to the resistance of motor being too low and taking more current to start it than the dynamo can give. A dynamo with either H or drum armature would work a 3-pole armature motor, if latter is wound for the same voltage and current as the dynamo. Or a dynamo wound for 2 or 3 volts and 8 or 10 ampères would run the 2-volt motor.

[3688] **G.W.R. Loco, "Lord of the Isles."** A. H. D. (Neath) writes: Would you kindly give me end views of G.W.R. loco, "Lord of the Isles" class, with dimensions of width of buffer-plate, gauge of rails, diameter of axle, diameter of boiler, diameter of smokebox, diameter of funnel at the top, and height of funnel; also size of cylinder suitable for this size loco



The following are particulars required: Width of buffer-plate, 7 ft. 7 ins.; diameter of smokebox, 5ft.; diameter of driving axles, 7½ ins.; of bogie wheels, 6 ins.; gauge, 4 ft. 8½ ins. For ½-in. scale model: cylinders, ½ in. by 1 in.; for ¾-in. scale, ¾ in. by 1½ ins.; for 1-in. scale, 1 in. by 2 ins.; boiler, 4 ft. 2 ins. diam. Some of these dimensions are approximate, as full working drawings have not been published; see *Engineer*, June 28th, 1895, and October 28th, 1892.

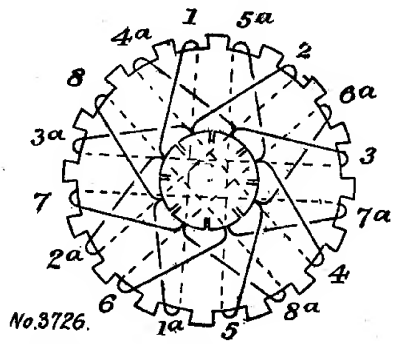
[3743] **Liquid Fuel for Models.** G. W. (Hamble) writes: Kindly give me as much information as you conveniently can regarding liquid fuel burners for model boilers, small size locomotives in particular. Can methylated spirits be used for this, successfully and safely?

The best burners for paraffin oil (which is the safest liquid fuel to use) are those protected by Swedish patents. For model marine boilers those burners which give a horizontal flame like a painter's blowlamp are the best. For locomotives there is a type known as the "Primus"; these are of two kinds, the silent and those which give a blowing flame and make a noise. They are all rather deep, and the pipes carrying the oil to the burner require bending round to a horizontal position, to reduce depth and for convenience of coupling to the oil tank. The smallest burner is one of the Primus "noisy" type, which is circular on plan and is 1½ ins. diam., and when modified is 2 ins. deep. The smallest silent is 2½ ins. diam., and the largest 3 ins.; the other dimensions about the same as the 1½-in. size. The consumption of oil varies from ½ to ¼ pint per hour. A member of our staff made a burner on the same principle, but for methylated spirit; but it was a failure and there seems no hope of success in this method of firing, even if it was likely to be advantageous. All kinds of oil fuel burners are sold, but they all require modifications for use in models. A "silent Primus" stove is a very good thing for the workshop or for the house, and amateurs who have not a gas stove would find such a stove very handy for heating or soldering iron and annealing small articles, as well as for keeping the workshop warm, and learning something about oil fuel. The price is somewhere about 13/6, all complete. We hear that a burner is about to be placed upon the market, especially adapted for models.

[3726] **Drum Armature.** J. P. S. (Charlton) writes: Will you please answer a few questions relating to the Manchester type dynamo described in your answer to Query No. 2748B in THE MODEL

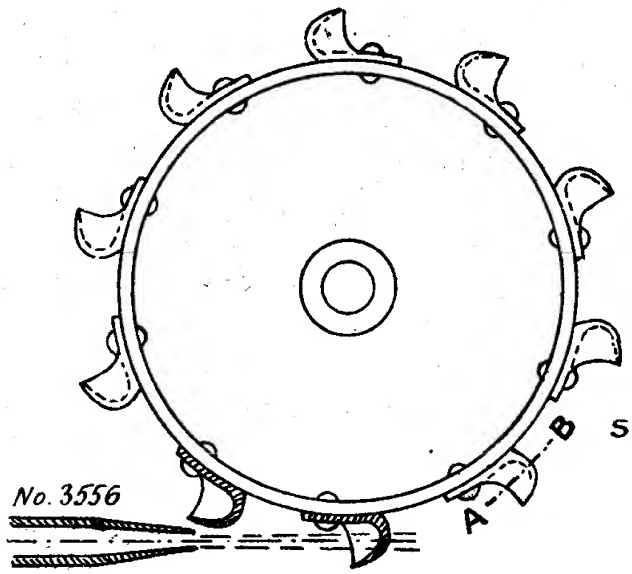
ENGINEER for February 1st. I wish to substitute drum for ring armature. (1) Will you give me best winding diagram for 16-cogged drum, with connections to 8-part commutator? (2) Diameter and length of commutator? (3) Length of armature? (4) Will there be any difference in amount of wire on ring and drum armature? (5) Width and depth of slots? (6) Would a ⅜-in. spindle be strong enough? (7) Could I get enough power from house-tap with Pitman's water motor to drive this machine? (8) Cost of stampings? (9) What wire gauge do you refer to?

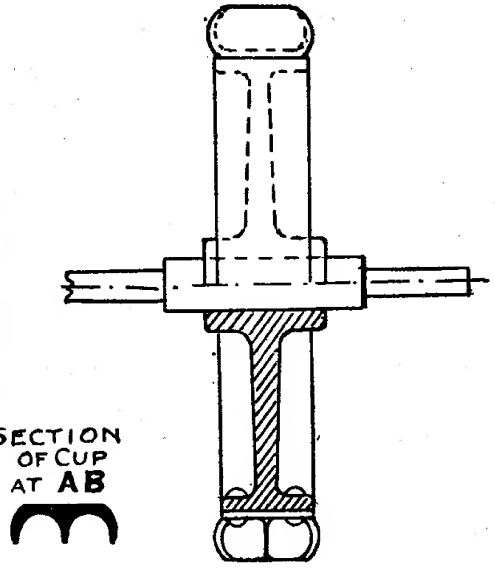
(1) Diagram for drum winding is given below. First wind coil



No. 1 in slots 1 and 1A, then turn armature half round and wind coil No. 5 in 5 and 5A; proceed with 2 and 6 in the same way. (2) Commutator, 1½ ins. diam. and 1 in. long. (3) Armature, 2½ ins. long. (4) There would be very little difference in the quantity of wire required. (5) Slots may be about 5-16ths in. wide and 5-16ths in. deep. (6) Spindle may be ⅜ in. diam. at bearings, and 7-16ths in. to ½ in. between them. (7) The power will depend upon the pressure of water in the mains. (8) Write to Mr. Avery, of Tunbridge Wells, for his price list of parts. (9) The wire gauge used is the "Standard Wire Gauge" (S.W.G.)

[3556] **Pelton Water Wheel.** R. O. U. (Didsbury) writes: I am going to make a model Pelton water motor, but cannot find any books on the subject. I should be much obliged if you could answer the following questions, and also, if possible, give a small sketch of the design. (1) Size and shape of cup in relation to the jet. (2) Size of wheel and number of cups. (3) Power produced by a 3-in. wheel running from ordinary house tap. I should like to make it as much like a real one as possible.





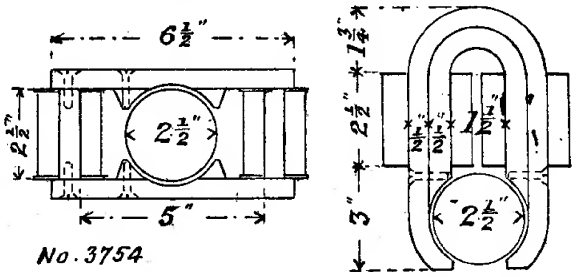
If the Pelton wheel is to be 3 ins. diam. overall, make the rim on which the cups are fixed about 2½ ins. diam. It should have ten cups of the shape shown. The jet may be about 1-16th in. diam. The power and speed depends on the pressure of water.

[3746] **Alternating Currents, &c.** H. R. (Leeds) writes: Am I right in assuming that there are two alternations in one period in a single-phase current and four alternations in one period in a two-phase current, and six ditto in one period of a three-phase current? If I am incorrect, please explain. Also, how many alternations in one period of a polyphase? In a single-phase current with a periodicity of 83 cycles per second would there be 166 alternations, and in a 3-phase of same periodicity 249 alternations? What is the reason of alternating current arc lamps pumping? These lamps worked alright until the shunt coil was burnt and had to be re-wound. Will you kindly tell me what to do to remedy this? I have tried to adjust the brake in order to help the lamp to strike the arc, but this makes the lamp pull and robs the other one of the current. The lamps are two in series.

There are the same number of alternations as there are periods in an alternating current. A two- or three-phase current is two or three separate alternating currents derived from one machine, differing in phase. "Polyphase" means more than one phase. Pumping in arc lamps is caused by the shunt coil not being strong enough, so that the series coil strikes too long an arc and breaks the circuit. The shunt coil has probably been re-wound with a different number of turns or higher resistance than before. If there are any adjusting weights in the lamp, extra weight should be put on to oppose the series coil.

[3754] **Simple Dynamo.** E. F. W. (Warminster) writes: I am thinking of making a dynamo. I have a bar of iron 4 ins. by ½ in. Would this be of any use? If so, please give size to get the most output, how to wind it, and what wire, and what kind of armature, and what power it would take to drive it.

A field-magnet of either of the forms shown below could be built



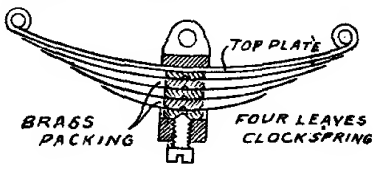
up from the 4 in. by ½ in. bar. The armature should be a slotted drum, 2½ ins. diam. by 4 ins. long, with 12 or 16 slots about 5-16ths in. wide and ⅜ in. deep. Wind it with ½ to ¾ lb. No. 20 D.C.C. wire, and the field-magnet with 4 lbs. No. 22 S.C.C. Output, 15 to 20 volts and 5 or 6 ampères, at 2,500 revolutions. It would take about ¼ h.-p. to drive it.

[3757] **G.W.R. "Lord of the Isles."** A. F. C. (London, S.W.) writes: As I have read THE MODEL ENGINEER for some time, and never seen the G.W.R. "Lord of the Isles" mentioned as a model, except February 15th, 1901, would you mind answering the following questions? (1) Would it make a good ½-in. model (2½-in. gauge)? (2) Could the wheel base be so arranged that, without altering the exterior appearance, it could turn in a circle 6 ft diam.? (3) What would you consider a fair price for engine and tender made as near that specification as possible, and no extra fittings (as steam gauge, etc.)?

(1) Yes; this engine would make a very handsome and good model. The only difficulty with ½-in. scale models with inside cylinders is the fitting of link motion, and if you want a fair model at a reasonable cost the best thing to use is a "slip" reversing eccentric. (2) A 6 ft. circle (3 ft. radius curve) is rather small, but the engine would easily tackle an 8 ft. circle. (3) Price—anything between £12 to £17, according to its finish and construction.

[3801] **Model Locomotive.** H. S. W. (Lancaster) writes: I am making a 1 in. scale loco, somewhat similar to the "Caledonian" in THE MODEL ENGINEER, and would be glad of the following particulars: (1) Size of steam pipes—(*a*) in boiler, (*b*) to cylinders; size of exhaust pipe and nozzle; (cylinders, 1¼ ins. bore by 2 ins. stroke; steam ports, ⅛ in. by ⅝ in.; wheels—5½ ins. diam. drivers and trailers, 4-coupled; 2⅝ ins. diam. bogie). (2) Particulars of spiral springs for driving wheels. Can I use spiral springs for trailing axles? If not, particulars of laminated springs; also of bogie springs – one spring for two wheels. (3) Thickness of brass or copper boiler plates and particulars of staying to stand 70 lbs. working pressure; boiler, 4¾ ins. diam.; barrel, 11 ins. long; firebox, 7 ins. long by 4¼ ins. wide. (4) Would Mr. Pearce be good enough, in his most instructive articles on the ¾ in. scale "Caledonian," to put any little alterations of sizes for a 1 in. scale model which are not exactly to scale with the prototype?

(1) Steam pipe in boiler, 5-16ths in. diam. inside; same size to cylinders, if one pipe—if two, ¼ in. inside diameter each. Exhaust pipe, ⅜ in. inside; nozzle, 3-16ths in. (2) Spiral springs for driving axle, about No. 18 gauge, ½-in. diam., and 1¼ ins. long. They may be used for the trailing axle. Laminated springs are used for the leading and trailing axles in locomotives, as they have a steadying action on the running of the engine; spiral springs being used for the driving axles, as they are more flexible and act quickly. The sizes of springs for model locomotives can best be found by experiment when the engine is nearing completion, and with spiral springs a long



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range of adjustment may be obtained. Laminated springs must be very much lighter than if made in proportion to those in full-sized engines. If the top plate of spring is made from ¼-in. or 5-16ths in. by 1-32nd in. steel, ends annealed and turned over, the rest of the laminations may be about a quarter of the usual number and of thin clock spring. To give the appearance of depth, pieces of 1-20th in. brass could be placed between each of the leaves of clock spring, as shown above – a setscrew at bottom pinching all up tight. (3) Thickness of plates for boiler, 5-64ths in.; rivets, 5-32nds in. diam., ½-in. apart; stays, &c., in proportion to sizes given in Fig. 22, "Model Boiler-making." (4) The sizes given for details of the ¾-in. scale "Caledonian," if made ⅓ larger, will be right for a 1-in. scale model.

[3865] **Where to get Aluminium.** J. H. (Wigan) writes: Where can I get aluminium or aluminium castings?

Aluminium in sheet or ingot can be obtained from Messrs. Smith, Metal Merchants, Clerkenwell, London, E.C.; Stanton Bros., Shoe Lane, London, E.C., or the London Aluminium Co., 108, Queen Victoria Street, London, E.C. We believe that several of our advertisers will make aluminium castings to your patterns, and you might write to such of these as you think most likely to do the work.

[3919] **Design for Motor Required.** C. O. (Fulham) writes: I want to make a motor; it does not matter what it is—steam, electric, or coal. The box in which the motor will be fixed is 18 ins. by 24 ins.; it is only to carry one person, and it will run on four wheels. I have been taking for the last three months THE MODEL ENGINEER, but I can't find anything that will do.

Your query is much too indefinite. We gather that you are desirous of building a motor for a motor-car. If this is so, we are afraid it is rather a large order for the Query department, and we could only refer you to the articles now appearing in this journal. If you will say definitely what you require, we shall be glad to assist you, if at all possible.

Queries from the following readers have been received up to the time of going to press, and will be answered in rotation. Queries received after this time and up to the date of issue will be notified in the same manner in the next issue:—

S. M. L. (Canada), W. H. J. (Shelton), W. W. (Streatham), H. J. (Walthamstow), C. H. C. (Kensington), W. O. (Openshaw), F. G. C. (Truro), A. K. (Moscow), G. H. (Saxmundham), H. W. B. (Burslem), C. R. B. (Gloucester), T. W. (Barnsley), L. G. C. (Spezia), L. C. D. (Hampstead), F. G. (Folkestone), M. C. (Chesterfield), E. W. L. (Balham), E. J. P. (Hackney), J. F. (South Shields), S. G. V. (Battersea), A. H. J. (Croydon), W. R. B. O. (Derby), W. D. (Bradford), W. H. B. (Newton), G. B. (Staffs.), H. G. S. (Widnes), J. S. (Walthamstow), C. O. (Fulham), W. S. (Dulwich), E. B. (Broadbottom), C. G. L. (Bristol), E. W. A. (Mottram), C. W. G. (Pinner), N. B. (Colwyn Bay), H. W. G. (Coventry), J. M. (Motherwell), D. H. (New Southgate), J. H. (Manchester), C. G. (Stroud), L. G. (Ealing), H. C. B. (Dulwich), G. N. (Chelsea), J. W. T. (Tooting), T. F. (Chiswick), A. J. A. (Gateshead), T. B. West Bromwich), A. G. H. (Lincoln), F. L. (Ossett), A. C. (Edinburgh), J. B. (Cleckheaton), C. T. L. (Tunbridge Wells).

Amateurs' Supplies.

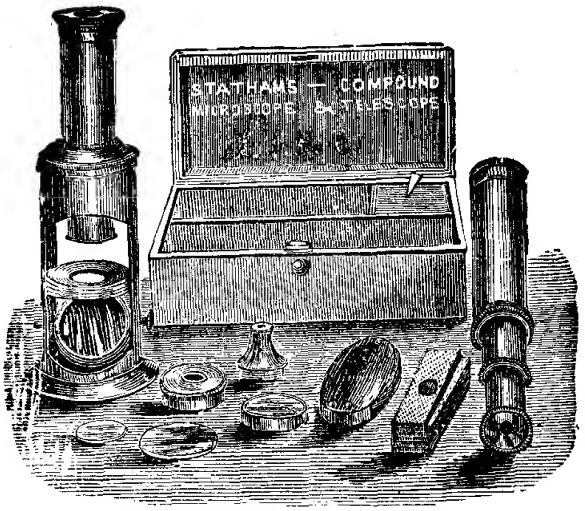
[*The Editor will be pleased to receive for review under this heading, samples and particulars of new tools, apparatus and materials for amateur use.*]

An Improved Gauge Glass for Amateurs.

Some samples of gauge-glass tubing emanating from Stevens's Model Dockyard, 22, Aldgate, City, London, are a vast improvement over the old time plain tubing commonly in use. The new tubing is made with a white enamel strip burnt in the glass and a thin pink line on the white. The effect of the water in the tubing is to magnify the pink line, and this it does to such an extent that the height of the water can be seen at a glance a very good distance away. We have tested samples of the new tubing against specimens of plain glass, and can assure readers that the stated effect is not in the least exaggerated. The principle has, of course, long been in use on large boilers, and we anticipate the endeavours of this firm to give model engineers the benefit of so considerable an improvement will meet with a deserved success. Seven sizes of the glass are stocked, and the prices asked are quite low. When writing for particulars of the tubing, the special list of fittings for model engines and boilers issued by the firm should be asked for. This is sent post free to MODEL ENGINEER readers.

A Holiday Present.

Those readers who are looking out for a suitable present for holiday use by the younger generation will find Statham's "Panopticon" worthy of attention. It is a combined telescope and microscope outfit at a moderate price, and capable of affording considerable amusement and useful instruction. The telescope itself is a well-finished and serviceable instrument of convenient size for the pocket, and is fitted with achromatic lenses and an extra solar eye-piece. By unscrewing the top tube of the telescope and inserting it in the microscope stand a very powerful microscope is provided, which is



THE "PANOPTICON" OUTFIT.

suitable for the general examination of all ordinary subjects. By the addition of the object glasses included in the outfit the magnifying power of the instrument is greatly increased, enabling very minute objects and delicate structures to be closely and clearly observed. A number of useful accessories, such as specimen objects, live box for insects, animalculæ cell, dissecting needles, glass mounting slips, pocket condenser and magnifier, &c., are included, making the whole set very complete. The "Panopticon" outfit is provided in two forms, one in a leather-covered case at 21s., and the other in a strong polished wood box, with additional appliances, at 27s. 6d. A complete descriptive circular may be had free on application to the Laboratory, 4, Oakhurst Grove, East Dulwich, S.E.

A Useful Table.

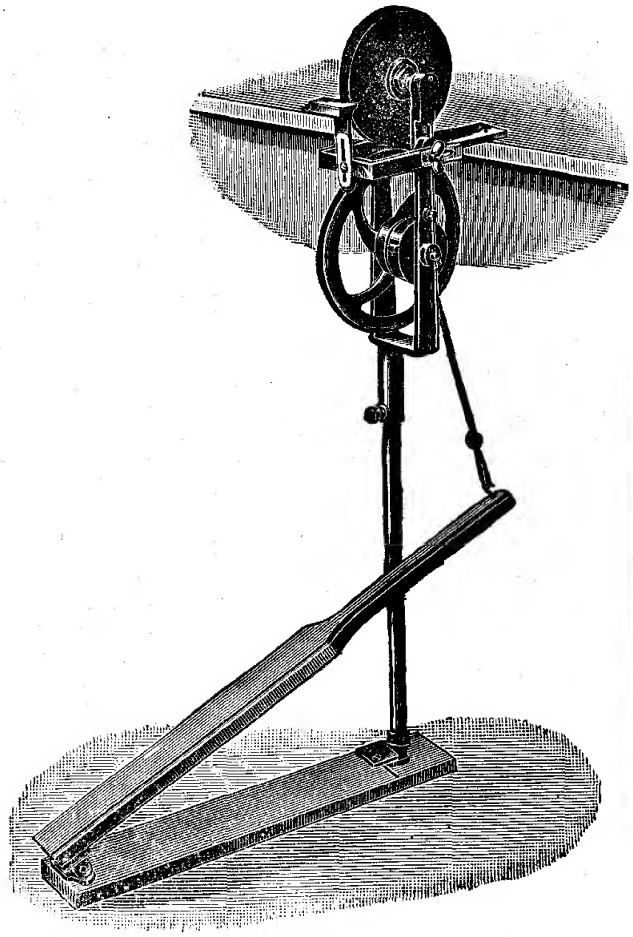
The Marks Adjustable Chair Company, 70, Jessel Chambers, Chancery Lane, London, W.C., are introducing an adjustable table which, though primarily intended for use as a bedside and reading table, will be found useful in many ways. For instance, it would serve very well as a drawing or writing table for workshop use, or for carrying experimental apparatus which may require adjusting in position in relation to other apparatus. The table top itself is made of polished quartered oak and the frame is of steel tubing. The table can be raised, lowered, or tilted either way at will. Full particulars will be sent post free on application to the above address.

Portable Storage Batteries.

The "Allan" accumulator, made in a number of very convenient sizes, is suited for medical and Röntgen-ray work, electric fans, and in all cases where a portable storage battery is a necessity. Other batteries are supplied by Messrs. Allan & Adamson, Limited, Cramshaw Lane, Ashtead, Surrey, specially arranged for launch, tramcar and yacht lighting work. Particulars and prices will be sent on application.

A Time and File Saver.

The small foot-power emery grinder which we show in the accompanying illustration has more uses in an amateur's workshop than some of our readers may be aware of. In the first place it is an admirable tool-grinder, especially for shaping-up lathe and other tools from a plain steel bar or from forgings, doing the work far more quickly than is possible on an ordinary grindstone, and obviating the necessity for using a file where much metal has to be removed. Another and important use, however, is in removing the rough skin from



castings which may have to be afterwards filed or turned, thus saving a considerable wear and tear of the files or turning tools. The emery wheel is 6 ins. diam. and ¾-in. thick, and runs at 3000 revs. per minute. It is operated by a treadle and clutch gear, the wheel, of course, running continuously in one direction. It always runs the right way, and always goes when the treadle is pressed down. The tool-rest, for supporting the tool or work which is being ground, is adjustable to any position. The price complete is 25s., and packing costs 1s. extra. These handy little machines are supplied by The Pittler Co., 144, High Holborn, London, W.C., where a sample machine can be inspected and tried by any reader calling at that address.

Catalogues Received.

The Universal Electric Supply Company, 47, Crossclifle Street, Moss Side, Manchester.—This firm not only keeps up to date, by issuing new lists from time to time with particulars of new or improved electrical supplies, but they are quick to give the purchaser the benefit of any reduction in prices which may be possible. The seventh edition of their catalogue recently to hand, evinces these points in a striking manner, and the fact that there is an increase in the number of pages and illustrations, together with the addition of some new features in the goods supplied, is sufficient to mark the firm as one ready to meet any demand on the part of our readers. The principal new section is devoted to electric lighting, and we are desirous of drawing special attention to this department, knowing it is not always easy for the amateur to get small or separate items for this work at anything like moderate prices, while obtaining good quality materials. In addition to the finished goods, the Universal Electric Supply Company list the separate parts, so that readers can make up their own bells, dynamos, telephones, shocking coils, batteries, accumulators, &c. To fitters of bells, telephones, and electric light the list should prove very useful, and where a trade card is enclosed special terms will be quoted. The firm is in no way connected with any other trading under any similar name, and the sole address is as given above. There is, perhaps, little need to dilate at further length, the majority of our electrical readers being well aware that this firm's catalogue is indispensable. The new list will be sent, post free, on receipt of 2d. in stamps.

W. Eaton, Whitestake, near Preston.—The very neat price list issued by this firm is to hand in the form of a new edition for 1901-1902. Readers will hardly need reminding that Mr. Eaton's injectors are the very thing for the model and small-power boiler, steam motor-car, &c., being self-acting and ready to start the moment steam is turned on. It is stated that the action is as certain as that of any pump, while the delivery of water at high temperature is a great advantage. All who have anything to do with boilers, model, small-power, or large, should get the price list of "Vic" injectors, which will be sent for a penny stamp, on mentioning THE MODEL ENGINEER.

Robert W. Blackwell & Co., Ltd., 59, City Road, London, E.C.—This well-known firm send us their excellently prepared catalogue (No. 34) of tubes for gas, water, or steam, cast-iron fittings, brass and iron cocks, valves, stocks and dies, screwing machines, pipe cutters, vices, &c. Our trade readers will many of them find this a handy and comprehensive list.

Dimmack Bros., 48, Dudley Street, Birmingham.—An attractive price list of "Albatross" cycles is to hand from this firm, and there is no doubt the machines listed are good value. The prices are most moderate, and we especially recommend readers in the district to inspect this firm's productions when they are thinking of purchasing new cycles.

Perry & Co., Ltd., Lancaster Street, Birmingham.—This is a trade list for cycle makers and agents. It is splendidly produced, and as it contains particulars of a great variety of cycle components and accessories for the new season, will be anxiously sought by the trade. The name is sufficient indication of the quality of the goods.

Norton & Gregory, 24, Westminster Palace Gardens, Artillery Row, Victoria Street, Westminster, S.W.—Messrs. Norton and Gregory send us a sample book of some of their tracing papers and linens. They are of excellent quality, the stout tracing papers being of a superior texture and very transparent.

Drake & Co. (late Model Supply Co.), 4, Balfour Street, Bradford.—The fifth edition of the illustrated price list issued by this firm is replete with particulars of the most interesting models—interesting, because they are mostly from designs published in this journal. Some of the latest of these are the boring machine, motor tricycle and parts, the 4-in. spark coil, parts for model railway track, and Mr. Smithies' design for locomotive. The price of the new catalogue is 3d., post free.

Notices.

The Editor invites correspondence and original contributions on all amateur mechanical and electrical subjects. Matter intended for publication should be clearly written on one side of the paper only, and should invariably bear the sender's name and address. It should be distinctly stated, when sending contributions, whether remuneration is expected or not, and all MSS. should be accompanied by a stamped addressed envelope for return in the event of rejection. Readers desiring to see the Editor personally can only do so by making an appointment in advance.

This journal will be sent post free to any address for 6s. per annum, payable in advance. Remittances should be made by Postal Order.

Advertisement rates may be had on application to the Advertisement Manager.

HOW TO ADDRESS LETTERS.

All correspondence relating to the literary portion of the paper, and all new apparatus and price lists, &c., for review, to be addressed to THE EDITOR, "The Model Engineer," 37 & 38, Temple House, Tallis Street, London, E.C.

All correspondence relating to advertisements to be addressed to THE ADVERTISEMENT MANAGER, "The Model Engineer," 37 & 38, Temple House, Tallis Street, London, E.C.

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